HP TURBINE RETROFIT				
Bid Award Evaluation				
Item	GEII		Alstom	
Requested Unit 2 2002 Outage Start Date	March 29, 2002 One month setback		No Change Requested	
Guaranteed Delivery Date for Unit 2 HP	April 1, 2002		March 1, 2002	
Guaranteed HP Section Efficiency	92.1%		92.4%	
Guaranteed Section Wheel Power Output	293.480 MW		293.6 MW	
Unit 1 HP Section - Base Bid	$4,100,141		$4,000,000	
Unit 2 HP Section - Base Bid	$4,100,141		$5,050,000	
Field Engineering Services - Unit 1	$539,676		Included in base bid	
Field Engineering Services - Unit 2	$501,751		Included in base bid	
Alignment Services - Unit 1	$40,100		$45,000	
Alignment Services - Unit 2	$38,500		$45,000	
Freight - Unit 1	$25,000		Included in base bid	
Freight - Unit 2	$25,000		Included in base bid	
IPSC Cost for Unit 1 HP Disasssembly in 2001	0		$100,000	
HP Performance - Bid Evaluation Credit	($14,800)		($40,000)	
HP Output - Bid Evaluation Credit	($50,000)		($80,000)	
Tota Cost Without OEM Labor (IPSC Labor)	**$9,305,509**	Bid Schedule: 42.3 days	**$9,120,000**	Bid Schedule: 30 days
OEM Labor - Unit 1	1,337,993		$1,260,000	
OEM Labor - Unit 2	1,269,154		$1,210,000	
Subtotal for OEM Labor	$2,607,147		$2,470,000	
Total Cost Including OEM Labor	**$11,912,656**	Bid Schedule: 32 days	**$11,590,000**	Bid Schedule: 30 days
Recommend Using IPSC Labor Based on Both Economics and Quality				

IP7_034513

Part F - Detailed Specifications

Division F2 - Technical Requirements

1.0 General:

This specification provides the technical information required for providing both products and services associated with supply and replacement of the high pressure turbine sections, overhaul of the intermediate pressure turbine, internal alignment of these two sections and technical direction services for effectively completing all turbine work scheduled for both the March, 2003 Unit 1 Outage and the March, 2002 Unit 2 Outage at the Intermountain Generating Station (IGS).

2.0 Unit Description:

Intermountain Generating Station consists of 2 sister units operating S-2, triple tandem-compound, single reheat, 20- stage, impulse type turbines with a double-flow nozzle. The high pressure turbine is a partial arc design with 7 stages and one, 4th stage extraction. The turbine is controlled via a Mark II series electrohydraulic system.

The turbines have been increased in nominal output rating from an original installation output of 840 MWg to a current rating of 875MWg.

3.0 IPSC Planned Turbine Scope of Work:

The planned scope of work for the turbine generator during the Unit 2 outage beginning March 2, 2002 is:

- Replacement of the HP turbine section
- Major inspection and overhaul of the Intermediate Pressure Turbine section
- Testing and possible disassembly of the generator for repair of stator winding leaks.
- Main stop, control, combined reheat and ventilator valves
- Overhaul of servos, switches and PMG at front standard

The planned scope of work for the turbine generator during the Unit 1 outage starting March 1, 2003 is:

- Replacement of the HP turbine section
- Major inspection and overhaul of the Intermediate Pressure Turbine section
- Testing and possible disassembly of the generator for repair of stator winding leaks.
- Main stop, control, combined reheat and ventilator valves

- Overhaul of servos, switches and PMG at front standard

The above scopes of work are to be provided for each of two units at the Intermountain Generating Station during their respective outages. Bidders are encouraged to respond to the above specified outage start dates if possible. If adherence to the above dates places significant risk in either quality or delivery of the HP turbine section, the bidder may propose an alternate schedule for outage start date. Proposals with modified outage start dates more than 1 month later than those specified above, will likely be untenable.

4.0 Scope of Supply:

The scope of this specification includes the following:

1.Design, manufacture, shop testing and delivery of a new, high efficiency HP turbine section.
2.Field engineering services for on-site direction during installation of the new HP turbine section, overhaul of the IP section, overhaul of control, stop and combined reheat valves, overhaul of front standard servos and instrumentation and testing and operation of the completed turbine as listed in Section 6.0.
3.Field direction of electrohydraulic control system modifications for optimized valve operation including parts as required.
4.Internal alignment services for both the HP and the IP turbines.

5.0 Design Conditions & Criteria

The justification for this project rests on both performance and output. Therefore, all reasonable effort shall be made to identify and incorporate the most current and proven performance related technologies.

IPSC understands that by design, the new, high efficiency HP turbine sections are unable to provide both partial arc and full arc operational modes. Accordingly, IPSC chooses to specify a full arc operational design to take advantage of upper end operating efficiencies.

As a part of the modification to exclusive, full-arc control, the supplier shall provide required hardware and technical support for modifying existing valve operation. The supplier shall ensure that valve control, unit stability and generation flexibility are not restricted, encumbered or complicated beyond current capabilities.

The HP section shall be designed for the following throttle conditions and flow passing capability at valves wide open:

- 2400 psi
- 1000 F
- ????????? lbs/hr

The supplier shall be solely responsible for ensuring that all piping penetrations, instrument taps/wells, interfacing keys and supports, journals, couplings, snout sections, seals, etc. are of proper location and dimension.

Maximum allowable vibration in any plane in the fully assembled and operating turbine is 2 mils p/p, overall reading.

The HP turbine sections provided for installation on Unit 1 and Unit 2 shall be operationally interchangeable in every regard.

6.0 Field Service Engineering

Field Service Engineers shall arrive on-site no later than two days prior to the respective outage scheduled start dates. Field Service Engineers shall be available in accordance with the planned outage shift schedule, from two days prior to the outage scheduled start date, until released by IPSC following successful startup and operation of the turbine.

At least two qualified Field Service Engineers shall be provided, one for the day shift and one for the night shift. The engineers shall perform the following functions:

-Technical direction to IPSC for disassembly, cleaning, inspection, repair, part replacement, reassembly, rotor alignment, balancing, etc. of the steam turbine-generator.

-Assist IPSC with overhaul planning, schedule preparation and schedule updating.

-Prepare, and submit to IPSC, a technical report which details the inspections, repairs, and future recommendations related to the work done on the turbine-generator.

The Field Service Engineers shall have had formal training for field engineering on large, impulse design, steam turbine-generators. The Field Service Engineers shall have at least 10 years of field engineering experience in installation, repair and operation of these type machines.

7.0 Internal Alignment Services

The supplier shall provide labor, supervision, expertise, tools and equipment for full internal alignment of the HP and IP sections of the turbine. Where laser alignment technology is employed the supplier shall test all equipment at his shop prior to mobilizing to the site to prevent downtime due to faulty equipment.

The supplier shall provide adequate numbers of trained personnel in order to judiciously pursue completion of the internal alignment without interruption, during the scheduled alignment window.

Alignment personnel must be able to effectively coordinate all alignment information with the Field Service Engineers at the site, regardless of corporate affiliation. Personnel conducting turbine internal alignment work shall be trained and qualified in the procedures used and in operation of the equipment required for the work. The personnel shall have performed the same work on at least ten previous occasions, and at least five of those on large, impulse design steam turbines.

8.0 IPSC Provided Facilities

IPSC shall provide a single desk in an enclosed office trailer on the turbine deck for the field engineers to use. The trailer will also be occupied by IPSC personnel.

IPSC shall provide a single telephone line in the office trailer for use by the Field Service Engineers.

IPSC shall provide access to a fax and copy machine for use by the Field Service Engineers.

9.0 Reference Drawings

-Original acceptance heat balance (Figure 1)
-Current heat balance (Figure 2)

10.0 Operating Experience

Intermountain Generating Station has operated for the past 5-6 years with net capacity and availability factors in excess of 90%. Net output in excess of 95%.

Weekly valve and yearly tightness and overspeed testing has been successfully completed since original installation.

Turbine startups have been relatively smooth on both units. Only rarely is a balance shot required during startup.

On-line vibration is rarely above 3 mils p/p on any bearing. With continuous vibration archiving and trending capability, actions levels are based both on rates of change and on absolute vibration levels.

A load profile (Figure 3), typical of recent years is enclosed for your information.

11.0 Maintenance History and Provisions

The Intermountain turbines were overhauled completely by the OEM, on one occasion approximately 2 years after commercial operation. Since that time all maintenance on the turbines has been performed by IPSC personnel under the direction of a Field Service Engineer.

Turbine oil is monitored by on-site, predictive maintenance personnel who are fully trained in ferrographic, particulate and inductively coupling plasma analysis. The turbine oil was recently replaced on both units as the oil additive packages were showing signs of degradation affecting the oil/moisture separation properties. However, moisture has remained continually within allowable limits.
IPSC is aware of no dimensions affecting the installation of a new HP that have been modified since installation. The only significant modifications to the turbine since startup

are follows:

- Hydraulic Coupling Bolts, (Ovako, Inc.)
- Retractable Packing, (Turbocare, Inc.)

The IPSC turbine bay crane is rated at 95 tons.

12.0 Manufacturing Schedule

Within six weeks of award, the supplier shall submit a detailed schedule showing all facets of completion of the HP turbine section and associated components. The schedule shall include:

- Order placement for material stock for each major component
- Expected delivery to manufacturing facilities of stock for each major component.
- Start of material acceptance testing for each major component
- Start of manufacture of each major component
- Start of shop testing for each major component
- Start of component sub-assembly, (i.e. rotor assembly, diaphragm assembly, etc.)
- Start of sub-assembly testing, (i.e. rotor testing, diaphragm NDE and final dimensions)
- Start of assembly (alignment, etc.)
- Final assembly dimensional verification

Updated manufacturing progress reports shall be prepared and submitted to IPSC on a monthly basis up to the date of final inspection and shipment. In addition to updated manufacturing and testing schedules, the supplier shall provide notification of testing identified by IGS as 'witnessed tests' in Section 17.0, 'Quality Assurance', at three separate intervals prior to the day of the test in order to allow for IGS travel arrangements:

- 30 days prior to the test
- 14 days prior to the test
- 7 days prior to the test

The supplier shall provide construction drawings for approval by IPSC prior to start of fabrication. Required approval date shall be clearly identified at the time of construction drawing submittal to IPSC. Approval of construction drawings shall not relieve the supplier of sole responsibility for proper design and manufacturing accuracy and quality,

13.0 Delivery Schedule and Incentives

The Unit 2 HP turbine section and associated components shall be delivered at the IGS facility no later than February 18, 2002.

The Unit 1 HP turbine section and associated components shall be delivered at the IGS facility no later than February 17, 2003.

For delivery of the HP section to the site two (2) weeks ahead of the outage start date the supplier will be allowed to avoid two days of penalty beyond his guaranteed installation schedule prior to any penalty being assessed. This means that with delivery two weeks ahead of the scheduled outage date, the maximum outage extension penalty will be reduced to $800,000 and will not begin accumulating until two days past the guaranteed installation schedule identified within the bid.

For delivery to the site after 12:00 midnight on the respective IGS delivery dates noted no early payment shall be made.

For delivery after March 1, 2002 for Unit 2 or after February 28, 2003 for Unit 1, a penalty of $200,000 will be assessed to the supplier to assist in paying for rebuild of the existing HP turbine section.

14.0 Installation Schedule and Incentives

IPSC is encouraging base and alternate bids that key on innovative methods for minimizing installation schedules while maintaining verifiable installation quality. The respective outages have a currently scheduled nominal length of 30 days. This 30 day schedule is defined as 'Breaker Open' to 'On-Line and Available for Full Load'.

All bidders shall prepare a 'guaranteed' installation schedule for the HP turbine replacement. The bid outage schedule for replacement of the HP turbine section shall provide detail from 'Breaker Open' to ' Turbine on Turning Gear'. The current maintenance schedule shows this as approximately 28 days.

The bid schedule shall include task level detail for removal of the existing HP section, field accommodation work within the existing HP shell and full installation of the new HP section including alignment. Major milestones shall include as a minimum:

- New HP components staged and ready for installation
- Turbine off gear and lube oil isolated
- Removal of HP outer shell
- Removal of HP rotor
- Removal of HP L/H casing
- Completion of L/H outer shell prep work and dimensional verification
- L/H casing installed
- Alignment complete
- Rotor installed
- U/H casing installed
- U/H outer shell installed
- HP installed and coupled

The current maintenance schedule is based upon a dedicated, HP turbine section crew consisting of 6 maintenance mechanics working 2 each 10 hour shifts per day, 6 days per week.

For each day that the outage length is extended due to the supplier's products or actions or the direct installation requirements of the new HP turbine section, the supplier shall be assessed a penalty of $100,000. The penalty maximum assessed for outage extension shall be 10 days or $1,000,000.

If the turbine section is delivered late and IPSC elects to proceed with installation of the new HP turbine, no outage extension penalty shall be assessed unless and until the suppliers bid installation schedule is exceeded due to the suppliers products, actions or direct installation requirements.

At least 90 days prior to the respective scheduled outages the supplier shall have a coordination meeting with IPSC Outage Management and prepare a complete installation information package based on the specific approach and schedule selected by IPSC. This final detailed schedule shall be provided to IPSC within 10 working days of the coordination meeting and shall provide completely detailed sequential instructions on installation and alignment of the HP section, including any modifications to existing HP section hardware, special tooling, equipment or services that may be required.

Both the outage schedule and duration are subject to change by IPSC. In the event of any IPSC initiated schedule change, IPSC will immediately notify the supplier and negotiate a mutually agreeable resolution.

The supplier shall identify within their prepared outage schedule, any interface concerns with the simultaneous overhaul on the IP turbine including bearing type/composition and positioning, coupling alignment, etc.

15.0 HP Section Performance Testing:

Initial performance testing shall occur as soon after the outage as reasonably possible. IPSC anticipates the ability to complete the initial performance testing within 1-2 weeks of startup. However, several factors could develop that could delay the test, these factors include an inability to achieve stable or acceptable turbine vibration limits, lack of permission from dispatch authority, unforseen load demands or problems with other plant equipment.

In addition to initial performance testing, IPSC will complete a confirmation test approximately 30 days following initial performance testing. Performance incentives/penalties shall be calculated and awarded based on the average of the initial performance test and the 30 day confirmation test.

The supplier is invited to be present during all testing. IPSC will apply best effort to confer with the supplier regarding all issues that may affect the evaluated performance of the turbine.

IPSC will prepare a specification and engage a qualified contractor for the performance tests. For general information the following criteria will form the basis of the performance testing:

1. The unit shall be operated at steady state, full load for approximately 1 hour prior to start of test.
2. Steady state shall be defined as fluctuations of not greater than:
   - 1.0% of absolute pressure readings
   - 5.0 degrees F, temperature readings
3. Test shall consist of a minimum 60 minute test, with readings taken a minimum of every 2 minutes.
4. Target testing criteria shall be throttle flow of ??????lbs/hr @ 2400 psi throttle and MWg output of ???????.

Testing tolerance for all forms and all sources of testing uncertainty shall be 0.25%. This is based on the following testing accuracies:

- 0.1%, throttle pressure
- 0.1 psi, HP exhaust
- 0.5 degrees F, all temperatures

All readings shall be taken at two parallel points allowing for direct indication of faulty equipment. Both elements shall be monitored and recorded during the equalization period and throughout the performance test for increased accuracy. All testing instrumentation shall be calibrated and traceable to NBS Standards. Instrumentation shall be calibrated both before and after testing is complete.

The cost of one initial performance test following the outage and one confirmation test approximately 30 days subsequent, will be borne by IPSC. All testing shall be considered valid and contractually binding if the HP section efficiency is tested to be no more than 2.0 percentage points below design efficiency.

If the measured section efficiency, during either the initial performance test or the 30 day confirmation test is more than 2.0 percentage points below design, an additional test shall be run and paid for by IPSC, as soon after the first test as operationally reasonable.

If the first test is within the 2.0 % window or if the second test is outside(below) the 2.0%

window, the first test results shall be valid and contractually binding.

HP section efficiency shall be defined as measured across both the valves and the HP section; from throttle conditions to the HP section exhaust.

16.0 Performance Guarantees and Incentives:

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<u>TO PURCHASING: THIS COULD GO IN A COMMERCIAL SECTION</u>

Bidders shall be awarded a bid evaluation credit (not payable dollars) of $10,000 for each 0.1% in HP section efficiency, above 91%, that is guaranteed in the respective bid.

Bidders shall be awarded an evaluation credit (not payable dollars) of $50,000 for each megawatt of generation capacity above ??????????? MW at VWO, 2400psi throttle, guaranteed in the bid.

****

Supplier shall be penalized ????????? if throttle flow at VWO, 2400psi exceeds 6,975,000 lbs/hr. This penalty covers near term reduced pressure operation and required system modifications.

The supplier shall be awarded a cash incentive of $10,000 for each 0.1% in performance that is confirmed by the performance test results above 92%, up to a maximum performance cash incentive of $100,000. No testing tolerance shall be applied above 92% prior to calculating the performance incentive.

The supplier shall be penalized $10,000 for each 0.1% below guaranteed HP section efficiency that is confirmed by the performance test results, up to a maximum penalty of 100,000. This penalty shall not take effect until after the 0.25% testing tolerance has been applied.

The supplier shall be awarded a cash incentive of $50,000 for each Megawatt of generation in excess of the bid guarantee that is proven during the initial and 30 day confirmation performance testing, up to a maximum of 5 Megawatts or $250,000.

The supplier shall be penalized $50,000 for each Megawatt of generation below the bid guarantee output that is confirmed during the initial and 30 day confirmation performance testing, up to a maximum penalty of $250,000.

17.0 Quality Assurance:

Vendor shall implement a quality assurance program addressing all phases of design, manufacture, installation and startup of the HP turbine section. The purpose of the HP section Q/A program is to assure that:

1. Design documents, drawings, specifications, quality assurance procedures, inspections procedures and purchase documents are maintained current, accurate and under control.

2. The purchased materials, equipment and services conform to the requirements of these documents.

3. Receipt inspections, in-process inspections, examination and testing are complete and appropriate.

4. Subcontracted work is adequately inspected and monitored.

5. Special processes such as welding, heat treating, hot forming and NDE are of adequate quality

6. Welders and NDE personnel are adequately qualified.

7. Nonconforming equipment and materials is properly documented, controlled and dispositioned.

IGS shall have full access, at all times, to the quality assurance procedures, instructions and nonconforming reports applicable to the equipment and materials furnished under this contract.

The quality assurance manual shall include the manufacturing locations of each major component, all tests to be performed on each component and assembly and shall list the individuals with respective phone numbers that will be in charge of quality verification at each site.

The supplier shall, as a minimum, provide for the following levels of documentation, review and acceptance of quality assurance procedures and reporting on all major components including the following:

1. Rotor
2. Buckets
3. Diaphragms
4. Inner Casing
5. Inner Casing Bolts
6. 1st Stage Nozzle

(Test Definitions Note:
Witness: The test may be attended by an IPSC representative
Review: IPSC shall review the test results prior to start of mfg.
Copy: IPSC shall receive signed copy of the test results within 1 week.)

	Witness	Review	Copy
Chemical/Mechanical Properties			1,2,3,4,5,6
Mill Certifications			1,2,3,4,5,6

Heat Stability Testing			1
Non-destructive Testing (Incl. welds and castings)		1,2,3,4,5,6	
Dimensional Checks	1,2,3,4,5,6		
Balance/Overspeed Testing		1	
Final Shipping Inspection	1,2,3,4,5,6		

Additional examination or testing may be required by IPSC of any welds, castings or forgings with indications exceeding code allowables or those having been or requiring repair.

Where designs incorporate sectionalized rotors, the root welds shall be examined using MT methods. Final passes shall also examined using MT and shall examined using UT from three angles of maximum reasonable variation.

18.0 Bid Submittals:

In addition to any other requirements of these specifications, the supplier shall provide the following information with the bid submittals:

1. A list of all components provided, with mfg. part numbers and including component life expectancy.
2. Balance criteria to be imposed by supplier .
3. Estimated Shipping Weight and Installation Weight of assembled HP
4. Detailed explanation of methods and equipment to be used in performing turbine internal alignment.
5. List of any additional items which the contractor will need IPSC to provide, other than those listed in Section 8.0.
6. Resume and experience list for each field service engineer, technician, or other personnel to be involved in the IGS based portions of the work.
7. Detailed plan for any on-site inspection work that must occur in advance of the installation, including the upcoming Unit 1 outage beginning March 5, 2001.
8. A best approximation schedule for completing the following major milestones: (to be shown in multiples of 10 hour shifts using up to 6 trained turbine mechanics)
    - Old casing out
    - New casing on final shims
    - Rotor Aligned in bearings
    - HP reassembled
9. A list of any special tools required for installation or maintenance of the new HP section. Including balance weight placement or casing guide pins.
10. A list of recommended spare parts associated with the HP section. The list

shall include estimated life of each component and location/quantity of any supplier warehoused stock of each item.
11. Applicable section of each code and/or standard used in development and design of the HP turbine section including:
    ASTM - Materials Standards
    ASME - Performance and Construction Standards
    AISI - Material Standards
    ISO - Balance Standards (or applicable international standard)

19.0 Contract Document Submittals:

During the course of fabrication of the HP section, the supplier shall expeditiously submit the following information in accordance with the monthly updated, manufacturing schedules and reports outlined in Section 12.0:

1. Construction/fabrication approval drawings
2. A revised thermal kit based on the throttle conditions
3. Ongoing Q/A reports as specified in Section 17.0
4. Mill Certificates
5. Manufacturing progress reports
6. Rotor Balance Report including static unbalance at critical speeds and rated speed
7. Rotor Runout Report
8. Calculated Rotor Torsional Characteristics
9. Assembly and Interface Dwgs
10. Component and assembly rigging plan including accurate weight of each lift.
11. Piping connection and instrumentation port location drawings
12. Within 30 days after award the contractor shall submit a schedule of submittals including all drawings, by title and their estimated submittal and approval return dates.
13. Itemized list of each component type showing individual design weight.

20.0 Existing HP Section Availability

The existing, Unit 1, HP turbine at IGS is currently scheduled to be available for inspection, measurement and condition assessment during the upcoming outage currently scheduled to begin March 5, 2001. The following items are scheduled to be completed at that time:

1. The upper half HP section outer shell will be removed.
2. The 4th stage extraction line will be severed and drifted to allow access from the outside.

If the bidder desires to take advantage of this inspection opportunity, the bidder shall prepare and provide a detailed inspection plan along with the bid submittals as outlined in Section 18. The plan shall include the significant, foreseeable economic or schedule impacts that may occur as the result of the information to be gathered during the outage.

The successful bidder shall have up to four (4) days of access for inspection of the HP turbine on Unit 1. **The HP turbine inner casing will not be open.**

21.0 Shipping

All components and assemblies shall be packaged, coated, supported and secured to prevent corrosion, damage or deformation during shipping. Any damage sustained prior to delivery at the IGS facility shall be judiciously corrected by and to the account of the supplier.

Bearing journals areas shall be securely covered and protected by treated cotton cloth or acceptable equal to prevent inadvertent contact or corrosive elements.

22.0 Maintenance Manuals

The supplier shall provide 10 sets of maintenance manuals at time of delivery, including the following information:

- Detailed overhaul recommendations
- General Arrangement Dwgs.
- Rotor Clearance Drawings
- Diaphragm Alignment Dwgs
- Longitudinal X-section Elevation
- Shaft Torque Characteristic Plot

23.0 Warranty

Due to IPSC outage schedules, the supplier's warranty must extend at least two years beyond installation in order to verify the cause of and correct any significant efficiency reductions. Due to operational priorities, access to turbine components for warranty adjustments shall be at the discretion of IPSC.

IPSC shall retain the right to operate the components and equipment provided under these specifications regardless of any outstanding warranty issues. The supplier shall be released from any additional claims for damage incurred as direct result of such continued operation. Warranty obligations for defects not attributable to such continued operation shall remain the responsibility of the supplier.

Supplier shall provide schedule identifying any maintenance procedures or testing/inspection required to maintain the bid warranty provisions.

Bid Totals

	Unit 1(2003)	Unit 2(2002)
1.Price for Fully Assembled HP Turbine Section	________________	________________
2.Price for Aligned /Partially Dis-assembled Section	________________	________________
3.Price for Freight (Fully Assembled)	________________	________________
(Partially Assembled)	________________	________________
4.Contract Cancellation Cost: >16 mo. before ship	________________	________________
12-16 mo. before ship	________________	________________
10-12 mo. before ship	________________	________________
6-10 mo. before ship	________________	________________
< 6 mo. before ship	________________	________________
5. Field Service Engineering (To include all labor, expertise, travel, expenses and services.)	________________	________________

6. Field Service Engineering Rates for

Unanticipated Work Hours:	Regular Hours	______	______
	10-16 Hrs/day	______	______
	Holidays	______	______
	Travel time	______	______
	Expenses/day	______	______

7. Turbine Internal Alignment Services ______ ______
   (To include all labor, travel, expertise, expenses, equipment and services.)

8. Guaranteed HP Section Efficiency ______ ______
   (Measured across both valves and HP section.)

9. Guaranteed Gross Unit Output ______ ______

10. Price for Optional Retractable Packing ______ ______
    (Packing design must be approved by IPSC representative.)

11. Guaranteed Delivery Dates ______ ______

COMMERCIAL NOTES TO PURCHASING:

The bidder shall a provide a required payment schedule,

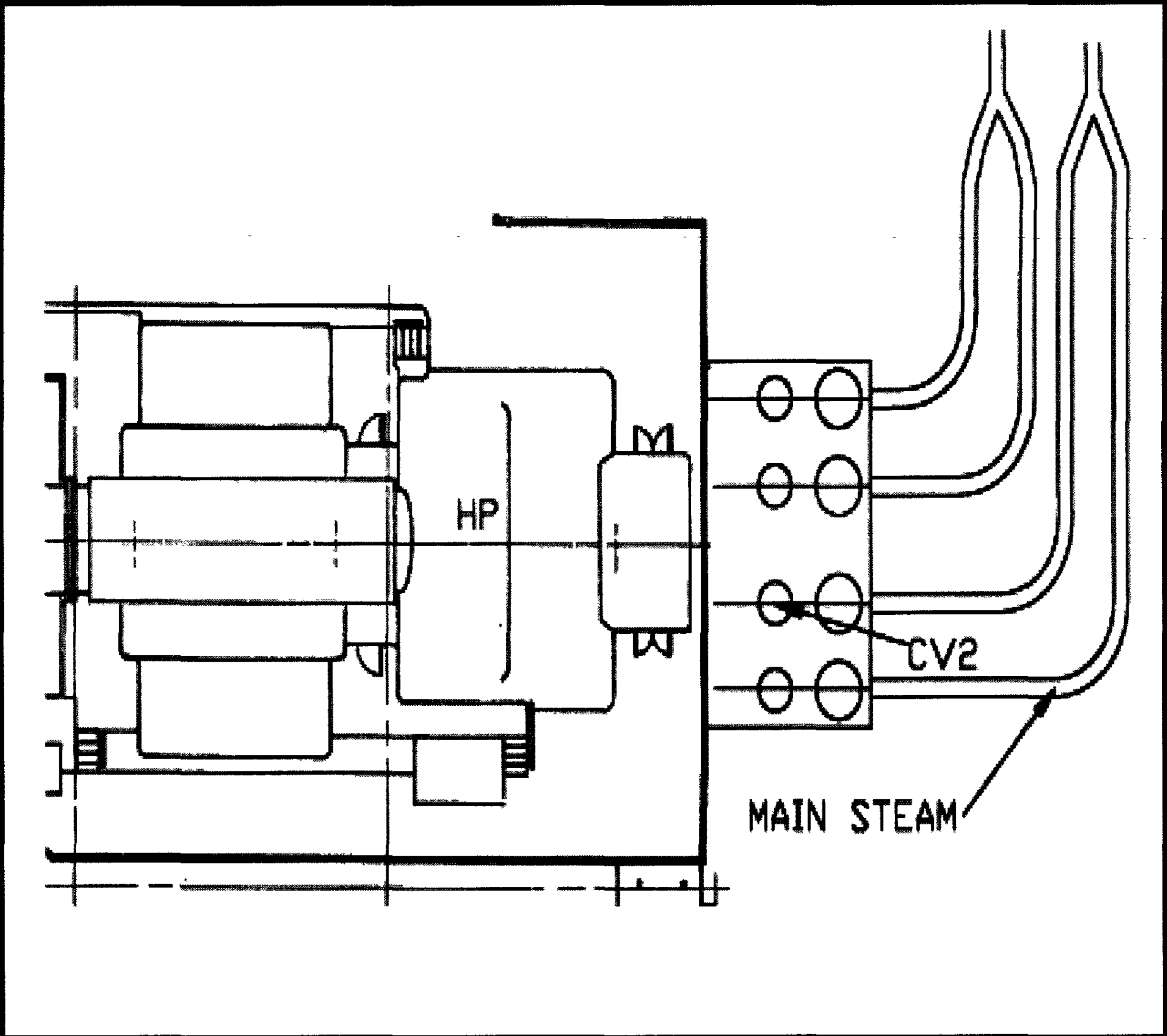
All costs associated with any reverse engineering shall be included with the original bid.

UNIT 1 FORCED OUTAGE
6/24/03-6/29/03

CONTROL VALVE #2 OUTAGE REPAIR

Control Valve#2 is one of four such valves regulating steam flow to the four quadrants of the high pressure turbine.

The control valves are the first line of defense against turbine overspeed.

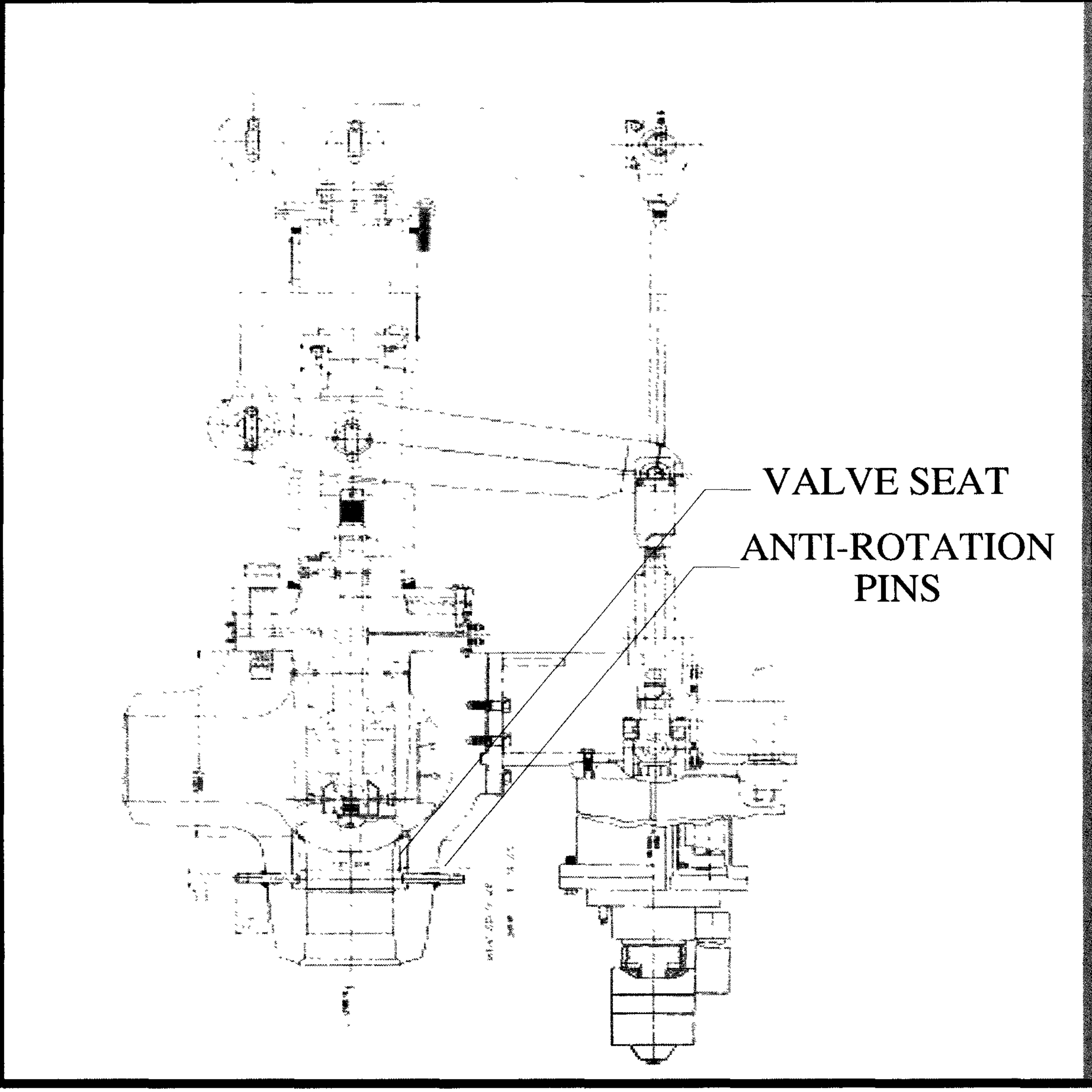


UNIT 1 FORCED OUTAGE
6/24/03-6/29/03

Upon disassembly the seat was found slightly loose in the valve body and all four anti-rotation pins had broken.

Removal and insertion of the seat is accomplished only with cryogenic seat temperatures and controlled valve body heating.

New pins and seat were machined to proper dimension and installed.

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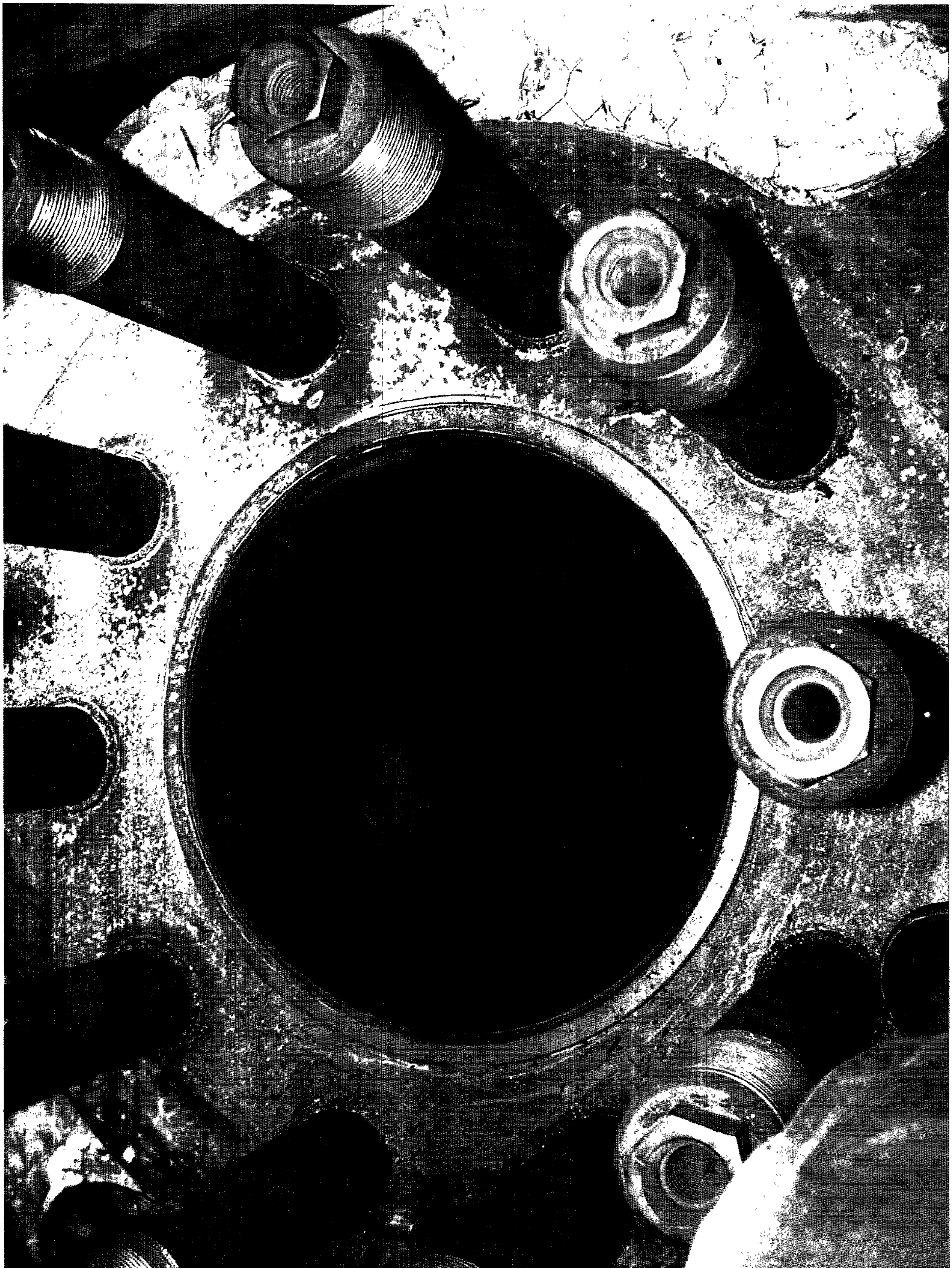
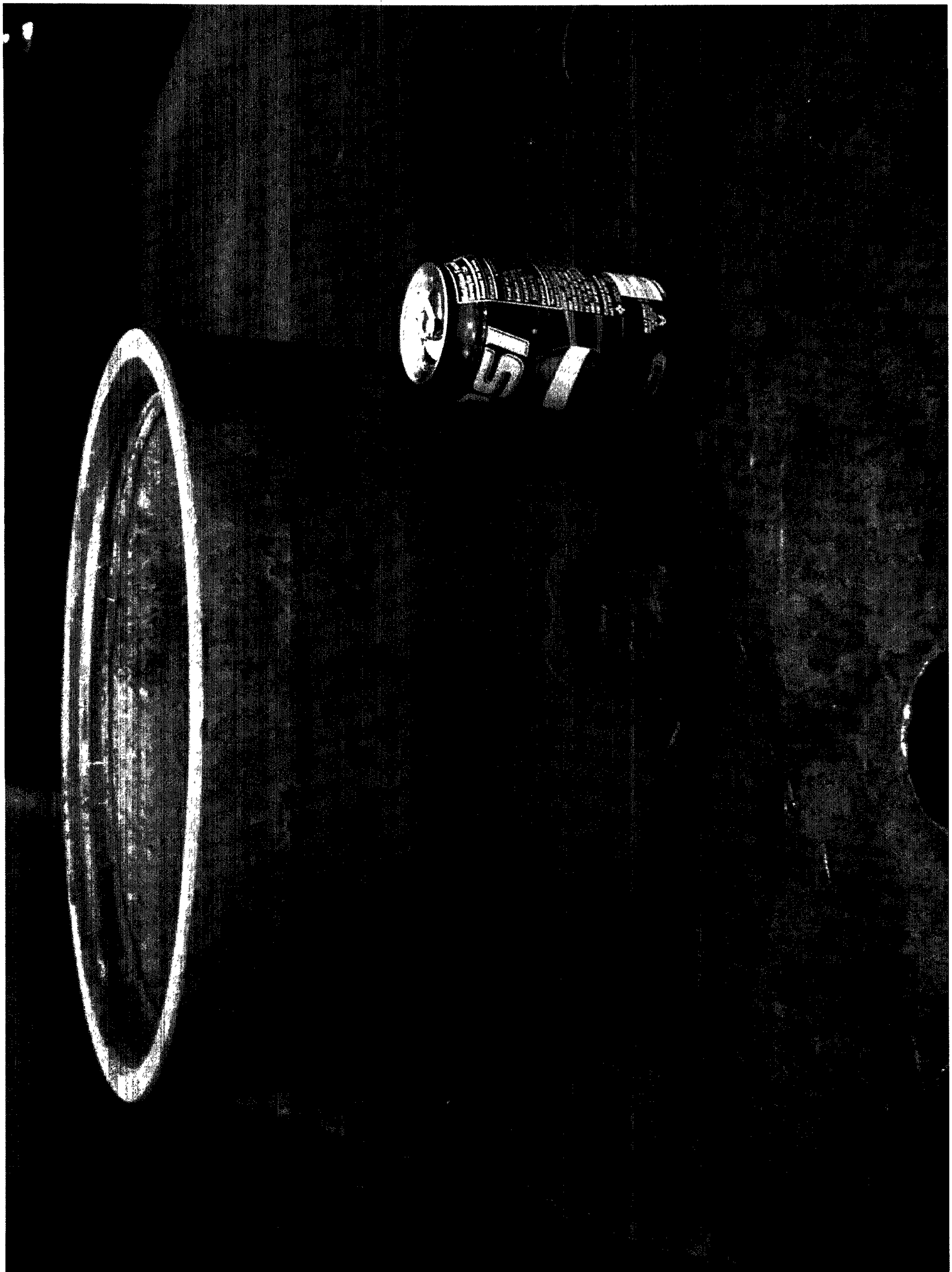
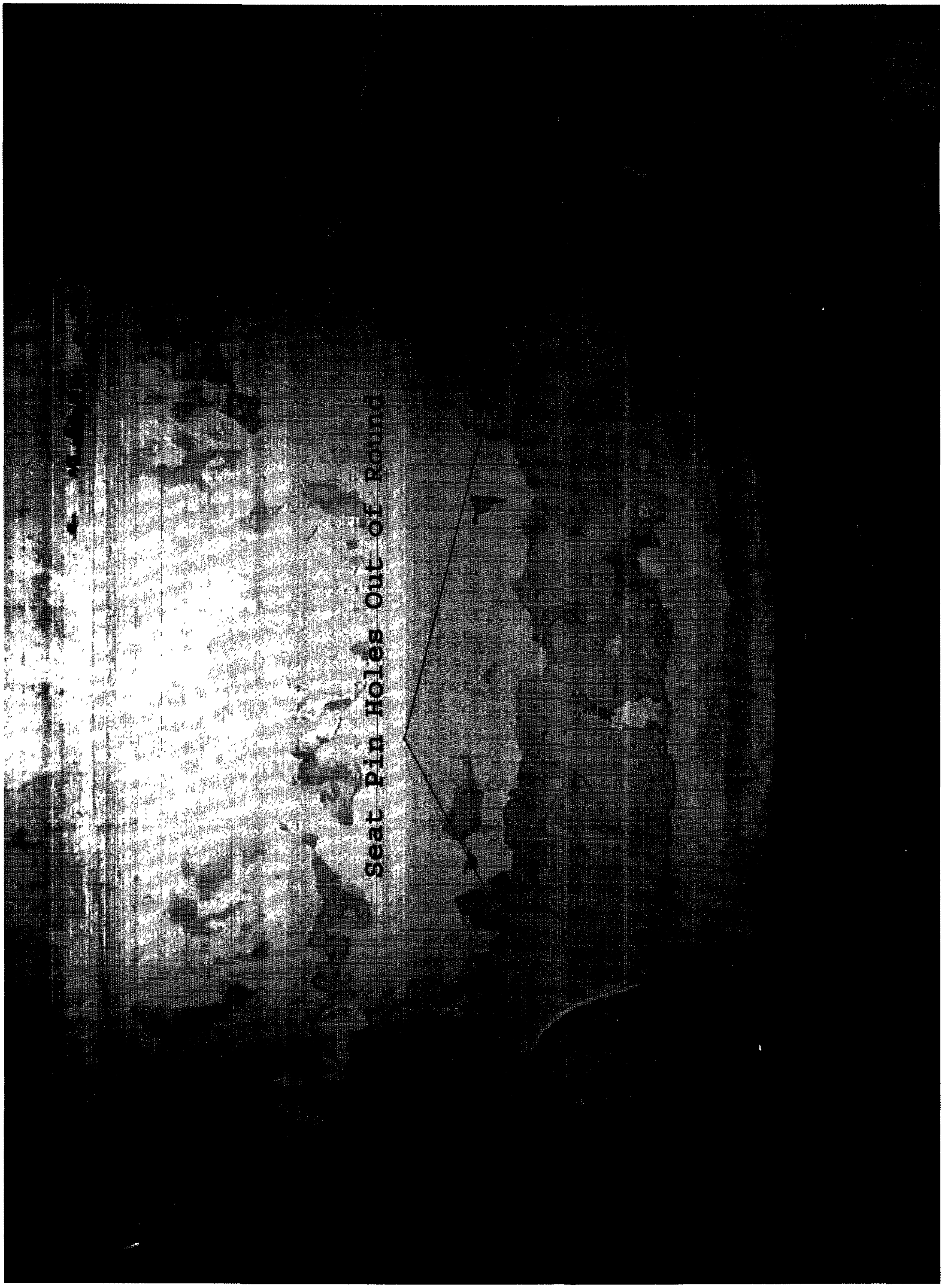
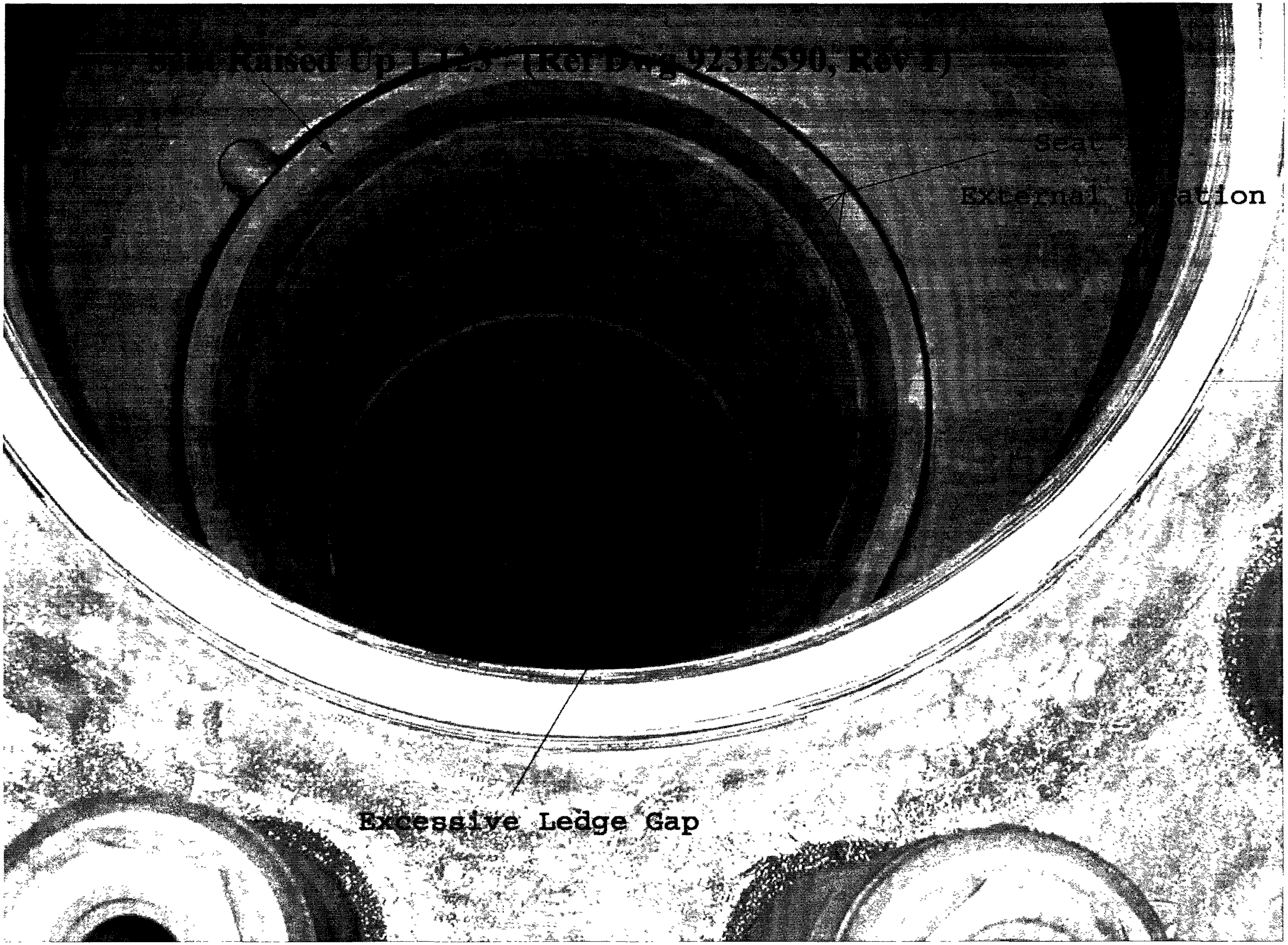





Seat Pin Holes Out Of Round


Raised Up
923E590, Rev
Seat
External
Excessive Ledge Gap


CV2 Pin Sheared Off
Pin


U1 CV#2 Sea

IP7_034540

SIMULATOR

- PRIMARY GOALS:
  - DCS logic & Database Validation
  - DCS and Unit Operation Training
  - Performance & Operational Improvement

- SELECTED VENDOR:
  - Esscor (Invensys)

- SCHEDULED MILESTONES:
  - Kick Off Meetings Held July 8-10
  - Model Design Underway
  - Integration with DCS in June-July 2004

DIGITAL CONTROL SYSTEM

Phased Replacement of the Coordinated Control System

- Primary Goal:
  - Replace Obsolete Control System at IGS
- Selected Vendor:
  - ABB - Best Value for Least Risk
- Schedule & Milestones:
  - Kick Off Meetings Held July 17-18
  - Controls & Phase I System Development Underway
  - DCS Installation Schedule:
    - U2 DAS & SOE - Mar 2004
    - U1 DAS & SOE - Mar 2005
    - U2 Control System - Mar 2006
    - U1 Control System - Mar 2007

UNIT 1 HIGH PRESSURE TURBINE

Performance Testing Results

	U1 Prior	U1 After	U1Guar.	U2 After
HP Section Efficiency (%)	83.5	92.4	92.2	92.8
HP Wheel Power (Mw)	NA	298.8	299	303.02
Gross Power (Mw@VWO)	888.0	981.4	973.2	988.7

(1% HP section efficiency is worth approx. $560,000 per year using current factors)

BOILER TESTING

- Why are we testing:
  - To satisfy the State Air Quality Board that the installation of overfire air does not increase CO emission above anticipated levels.
  - To verify compliance with contract requirements
  - More boiler tuning is required to lower CO

- Plan for Lower CO
  - Three Phase Tuning Plan
    - 1. Fuel Balance Testing (Completed 7/10)
    - 2. Fuel Balance Adjustments (Continuing thru approx. 8/31)
    - 3. Air Balance Adjustments (Continuing thru approx. 9/30)
  - Additional Testing
    - 56 Point Grid and Stack Monitoring

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Purpose of Materials, Supplies or Services:

Continued design work on the HP Turbine retrofit.

Date: 2/8/01	
Req./PA No: 162021	
P.O. No:	
Vendor:	
Terms:	
FOB:	
Ship Via:	
Conf. To:	

Suggested Vendor: ALSTOM Power, Inc
2800 Waterford Lake Drive
Midlothian, VA 23112
Attn: Greg Ferrara (804)763-7713

Account No. 2TGX-402
Work Order No. 01-19846
Project No.

Qty	Unit	Description: Noun / Adjective / Catalog # / Seller or Manufacturer	Unit Cost	Extension
1	job	Services, Design Engineering, in anticipation of	$202,000.00	$202,000.00
		final preparation and signature of a		
		Unit 1 and Unit 2 HP Turbine Section supply		
		contract, (#45510). Terms and conditions		
		within the anticipated contract (#45510) shall		
		apply to all work performed under this		
		requisition.		
		Monies shown on this requisition are part of		
		(not in addition to) the amount shown in		
		specification #45510.		
		Amount shown adequate to cover 5 additional weeks		
		(week 4 through and including week 8).		
		TOTAL ESTIMATED COST		$202,000.00

Remarks:

Delivery requested by [Date] 02/08/01 Originator James Nelson

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_034545

Coordinating Committee

HP Turbine Retrofit

Fabrication of the high performance, HP turbine section is proceeding slightly ahead of schedule. A number of project milestones have been reached and including one partial payment milestone.

Major items completed to-date include the following:
- Orders for materials for all major items have now been placed.
- Delivery of rotor to Alstom, U.K. for final machining. Rotor machining has commenced.
- Inner casing design drawing released to foundry. Inner casing casting to be complete on 9/14.
- All blading material has been received at Alstom, U.K.
- First stage blading material now in machining.

With the start of rotor machining on-site at the Alstom facility, Alstom is now eligible to invoice for the second, contract milestone payment. This invoice has been received and is currently being submitted for payment approvals.

Since the on-site design review at Alstom in Rugby, U.K., weekly conferenece calls with key project personnel have continued. These discussions include detailed review of material testing data, manufacturing progress and installation interface issues.

Final inspection and overspeed testing of the Unit 2 HP turbine at the Alstom facility in Rugby, U.K. is scheduled for mid December, 2001. This is one month ahead of the original schedule. Delivery of the Unit 2 HP section at the IGS site is currently scheduled for the second week of February 2002.

The Unit 1 rotor has also been received, tagged and set aside at the Saarchmeide, Germany facility. The Unit 1 HP turbine is scheduled for delivery in approximately December 2002.

Coordinating Committee Presentation Item

High Pressure Turbine Section Upgrade

Improvements in turbine steam path component and assembly technology in recent years is now providing economically significant benefits in both performance and unit output. Across the US, power generating units having been modified with higher efficiency turbine sections now number in the dozens. The associated economic justification is attached.

We have consulted with approximately 10 separate generating units of similar size and design as the IGS units. These units are generally experiencing increases HP section performance on the order of 6-8%. With HP section performance results between 91 to 93% as compared to pre-modification HP efficiencies of 84 to 85%.

The HP upgrade is a package of several technological improvements including:

1. Redesign of the nozzle box to allow for the addition of 2 to 3 more stages within the HP.
2. Latest technology seal designs on both stationary and rotating turbine elements.
3. Latest technology blade designs improving both steam utilization and steam path maintenance.

This retrofit can be installed within our normal outage window and will be performance tested in accordance with ASME enthalpy drop test criteria.

We have incorporated economic penalties and incentives into the specifications for achieving bid output, performance and schedule, to ensure both conscientious design and timely installation.

January 4, 2011

ALSTOM Power, Inc.
2800 Waterford Lake Drive
Midlothian, VA 23112

Dear Mr. Ferrara:

Letter of Intent to Establish Turbine Retrofit Contract

In view of the ongoing design work currently underway within ALSTOM Power, Inc., in support of an anticipated contract for supply of a high performance, HP turbine section for the Intermountain Power Project, we hereby issue this letter of intent to finalize and execute this contract based upon the currently agreed terms and conditions.

We also hereby recognize the necessity of immediately pursuing the preliminary design work in order to achieve the guaranteed delivery schedule. In the unlikely and unexpected event of contract cancellation prior to finalization and execution of the contract, IPSC will reimburse ALSTOM Power, Inc., for reasonable engineering costs incurred, based on the schedule of costs previously identifed within ALSTOM email submittal dated 1/8/01 from ALSTOM Power Inc to IPSC (copy attached).

We appreciate your commitment and assistance in support of a well defined contract to the mutual benefit of both ALSTOM and IPSC.

Sincerely,

President and Chief Operations Officer

JHN:

IPSC Board Meeting Item

High Pressure Turbine Retrofit Project

Introduction

A competitively bid contract was recently finalized for supply of hi-performance, high pressure turbine sections on Unit 1 and Unit 2. The specifications include guaranteed increases in both performance and output of approximately 8.0%. This equates to approximately 20 additional Megawatts of output with 0 increase in fuel consumption. Additionally, the HP sections will be designed to provide up to 55 MW per unit of additional output following specific modifications to balance of plant systems. The new turbine sections are scheduled for installation in March 2002 (Unit 2) and March 2003 (Unit 1).

Technology

Turbine steam path technology has seen substantial advances over the last 10 years. Designs that began with just improved sealing technologies have now progressed to three dimensional, computer developed surfaces, reducing both wear and steam path efficiency losses. The new HP section design incorporates latest technology sealing systems, blading designs and also includes at least one additional turbine stage within the HP section.

These modifications include the replacement of the inner high pressure casing, the wheel or rotor including all rotating blading, all diaphragms or stationary blading, new seals and new bolting. Computational flow dynamic (CFD) models are developed to ensure optimal stage pressure ratios and extraction flows as well as greater dimensional accuracy in the machining process.

The new section is designed with larger blading which increases steam path turning radii and reduces total blade end losses. The larger blading has proven to virtually eliminate solid particle erosion throughout the steam path. Avoiding repair of the steam path erosion occurring on our existing HP section nozzle box is one of the justification factors for completing this HP section retrofit.

These modifications have been completed at several dozen utilities world-wide and approximately 15 US utilities. Having had discussions with all 15 of these utilities we understand the concerns that have arisen and have set plans in place to avoid these concerns. Without exception, all 15 utilities consider their HP retrofit projects to be a considerable financial success.

Bid guarantees for both performance and HP section wheel power will be verified in section testing in accordance with established ASME PTC-6 standards. In addition to bid evaluation credits offered for high guaranteed performance and output, the specifications identify substantial penalties incurred by the supplier for each increment of guaranteed efficiency or output that the supplier fails to achieve within post-installation testing.

Summary

The high pressure retrofits on Units 1 and 2 provide the opportunity, with modifications in supporting systems, of a station (2 unit) output increase of up to 150 Megawatts. Forty (40) of these Megawatts being generated with no increase in fuel consumption.

Economic Analysis
High Pressure Turbine
Dense Pack Modification

Approximately two years ago, Alstom came to Intermountain and presented information on a proposed renovation of the high pressure turbines. GE has subsequently also contacted us regarding the same modification.

The proposed modification involves changing the existing double-flow hp nozzle box to a single flow design. By doing this they are able to add stages to the hp turbine and increase hp section efficiency. Both Alstom and GE claim to have data from installed units showing an increase in turbine efficiency (decrease in flow to achieve the same output) of at least 2.0%.

The modification will be a performance contract including pre- and post-installation testing on the hp turbine section for contract validation. The following economic analysis is provided for both performance benefits and increased generation capacity.

Economic assumptions:

1- Economic life:	20 years (PV of Annuity Factor 11.2)
2- Hours of operation/year:	7884 (8760hrs/yr)(0.9capacity factor)
3- Cost of money:	6.35%
4- Cost of generation:	$42,000/ unit hour ($48.00/MW hr)
5- Avoided cost of maintenance during 2002 outage:	$708,000
6- Avoided cost of lost generation to rehab the hp nozzle:	$1,944,000 (3 days of estimated 10 required)
7- Environmental cost of SCR addition:	$85,000,000/unit
8- Modifications to balance of plant at maximum flow:	$6,000,000/unit
9- High pressure turbine section retrofit:	$4,700,000/unit

Additional Generation Capacity at Existing Steam Flow:

Additional potential revenue
(20MW)($48.00/MW hr)(7884 hrs/yr) = $7,568,640

Payback: $\frac{\$2{,}048{,}000 \text{ (Item 9 - Items 5\&6)}}{\$7{,}568{,}640}$ = 0.27 years

Cost/ Benefit Ratio: (7,568,640)(11.2)/(2,048,000) = 41.4

Additional Generation Capacity at Maximum Steam Flow (including environmental costs):

Additional potential revenue
(50MW)($48.00/MW hr)(7884 hrs/yr) = $18,921,600

Payback: $\frac{\$95{,}700{,}000 \text{ (Items 7+8+9 - Items 5\&6)}}{\$18{,}921{,}600}$ = 5.06 years

Cost/ Benefit Ratio: ($18,921,600)(11.2)/(95,700,000) = 2.21

Performance Improvement at 875MW:

Fuel Savings
(2.25%)(6.3MMlb/hr steam flow)(916 BTU/lb)(1/.88 boiler eff.)
($1.51/MMBTU)(7884hrs/yr) = $1,756,546 ($2,873,165 @ 1500 BTU/Lb)

Payback: $\frac{\$2{,}048{,}000}{\$1{,}756{,}546}$ = 1.16 years

Cost/Benefit Ratio: ($1,756,546 X 11.2)/(2,048,000) = 9.60

Economic Analysis
High Pressure Turbine
Dense Pack Modification

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The proposed modification involves changing the existing double-flow hp nozzle box to a single flow design. By doing this they are able to add stages to the hp turbine and increase hp section efficiency. Both Alstom and GE claim to have data from installed units showing an increase in turbine efficiency (decrease in flow to achieve the same output) of at least 2.0%.

The modification will be a performance contract including pre- and post-installation testing on the hp turbine section for contract validation. The following economic analysis is provided for both performance benefits and increased generation capacity.

Economic assumptions:

1- Economic life:	20 years (PV of Annuity Factor 11.2)
2- Hours of operation/year:	8340 (8760 - 2.5 weeks ave.outage)
3- Cost of money:	6.35%
4- Cost of generation:	$42,000/ unit hour ($48.00/MW hr)
5- Avoided cost of maintenance during 2002 outage:	$708,000
6- Avoided cost of lost generation to rehab the hp nozzle:	$1,944,000 (3 days of estimated 10 required)
7- Environmental cost of SCR addition:	$85,000,000/unit
8- Modifications to balance of plant at maximum flow:	$6,000,000/unit
9- High pressure turbine section retrofit:	$4,700,000/unit

<u>Additional Generation Capacity at Existing Steam Flow</u>:

Additional potential revenue
(17.5MW)($48.00/MW hr)(8340 hrs/yr) = $7,005,600

Payback: <u>$2,048,000</u> (Item 9 - Items 5&6) / $7,005,600 = 0.29 years

Cost/ Benefit Ratio: (7,005,600)(11.2)/(2,048,000) = 38.3

<u>Additional Generation Capacity at Maximum Steam Flow</u> (including environmental costs):

Additional potential revenue
(50MW)($48.00/MW hr)(8340 hrs/yr) = $20,016,000

Payback: <u>$95,700,000</u> (Items 7+8+9 - Items 5&6) / $20,016,000 = 4.78 years

Cost/ Benefit Ratio: (20,016,000)(11.2)/(95,700,000) = 2.34

<u>Heat Rate Improvement at 875MW</u>:

Fuel Savings
(2.0%)(6.3MMlb/hr steam flow)(916 BTU/lb)(1/.88 boiler eff.)
(875/830)($1.51/MMBTU)(8760hrs/yr)(0.9cap factor) = $1,646,027/yr

Payback: <u>$2,048,000</u> / $1,646,027 = 1.24 years

Cost/Benefit Ratio: ($1,646,027 X 11.2)/(2,048,000) = 9.00

Economic Analysis
High Pressure Turbine
Dense Pack Modification

Approximately two years ago, Alstom came to Intermountain and presented information on a proposed renovation of the high pressure turbines. GE has subsequently also contacted us regarding the same modification.

The proposed modification involves changing the existing double-flow hp nozzle box to a single flow design. By doing this they are able to add stages to the hp turbine and increase hp section efficiency. Both Alstom and GE claim to have data from installed units showing an increase in turbine efficiency (decrease in flow to achieve the same output) of at least 2.0%.

The modification will be a performance contract including pre- and post-installation testing on the hp turbine section for contract validation. The following economic analysis is provided for both performance benefits and increased generation capacity.

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(17.5MW)($48.00/MW hr)(8340 hrs/yr) = $7,005,600

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Payback: <u>$95,700,000</u> (Items 7+8+9 - Items 5&6) / $20,016,000 = 4.78 years

Cost/ Benefit Ratio: (20,016,000)(11.2)/(95,700,000) = 2.34

<u>Heat Rate Improvement at 875MW</u>:

Fuel Savings
(2.0%)(6.3MMlb/hr steam flow)(916 BTU/lb)(1/.88 boiler eff.)
(875/830)($1.51/MMBTU)(8760hrs/yr)(0.9cap factor) = $1,646,027/yr

Payback: <u>$2,048,000</u> / $1,646,027 = 1.24 years

Cost/Benefit Ratio: ($1,646,027 X 11.2)/(2,048,000) = 9.00

January 4, 2011

ALSTOM Power, Inc.
2800 Waterford Lake Drive
Midlothian, VA 23112

Dear Mr. Ferrara:

Letter of Intent to Establish Turbine Retrofit Contract

In view of the ongoing design work currently underway within ALSTOM Power, Inc., in support of an anticipated contract for supply of a high performance, HP turbine section for the Intermountain Power Project, we hereby issue this letter of intent to finalize and execute this contract based upon the currently agreed terms and conditions.

We also hereby recognize the necessity of immediately pursuing the preliminary design work in order to achieve the guaranteed delivery schedule. In the unlikely and unexpected event of contract cancellation prior to finalization and execution of the contract, IPSC will reimburse ALSTOM Power, Inc., for reasonable engineering costs incurred, based on the schedule of costs previously identifed within ALSTOM email submittal dated 1/8/01 from ALSTOM Power Inc to IPSC (copy attached).

We appreciate your commitment and assistance in support of a well defined contract to the mutual benefit of both ALSTOM and IPSC.

Sincerely,

President and Chief Operations Officer

JHN:

IPSC Board Meeting Item

High Pressure Turbine Retrofit Project

Introduction

A competitively bid contract was recently finalized for supply of hi-performance, high pressure turbine sections on Unit 1 and Unit 2. The specifications include guaranteed increases in both performance and output of approximately 8.0%. This equates to approximately 20 additional Megawatts of output with 0 increase in fuel consumption. Additionally, the HP sections will be designed to provide up to 55 MW per unit of additional output following specific modifications to balance of plant systems. The new turbine sections are scheduled for installation in March 2002 (Unit 2) and March 2003 (Unit 1).

Technology

Turbine steam path technology has seen substantial advances over the last 10 years. Designs that began with just improved sealing technologies have now progressed to three dimensional, computer developed surfaces, reducing both wear and steam path efficiency losses. The new HP section design incorporates latest technology sealing systems, blading designs and also includes at least one additional turbine stage within the HP section.

These modifications include the replacement of the inner high pressure casing, the high pressure section wheel or rotor including all rotating blading, all high pressure section diaphragms or stationary blading, new seals and new bolting. Computational flow dynamic (CFD) models are developed to ensure optimal stage pressure ratios and extraction flows as well as greater dimensional accuracy in the machining process.

The new section is designed with larger blading which increases steam path turning radii and reduces total blade end losses. The larger blading has proven to virtually eliminate solid particle erosion throughout the steam path. Avoiding an approximate $3million repair of the steam path erosion occurring on our existing HP section nozzle box is one of the justification factors for completing this HP section retrofit.

These modifications have been completed at several dozen utilities world-wide and approximately 15 US utilities. Having had discussions with all 15 of these utilities we understand the concerns that have arisen and have set plans in place to avoid these concerns. Without exception, all 15 utilities consider their HP retrofit projects to be a considerable financial success.

Bid guarantees for both performance and HP section wheel power will be verified by section testing in accordance with established ASME PTC-6 standards. The specifications identify substantial penalties incurred by the supplier for each increment of guaranteed efficiency or guaranteed output that the supplier fails to achieve within post-installation testing.

Summary

The high pressure retrofits on Units 1 and 2 provide the opportunity, with modifications in supporting systems, of a station (2 unit) output increase of up to 150 Megawatts. Forty (40) of these Megawatts being generated with no increase in fuel consumption.

IPSC Board Meeting Item

High Pressure Turbine Retrofit Project

Introduction

A competitively bid contract was recently finalized for supply of hi-performance, high pressure turbine sections on Unit 1 and Unit 2. The specifications include guaranteed increases in both performance and output of approximately 8.0%. This equates to approximately 20 additional Megawatts of output with 0 increase in fuel consumption. Additionally, the HP sections will be designed to provide up to 55 MW per unit of additional output following specific modifications to balance of plant systems. The new turbine sections are scheduled for installation in March 2002 (Unit 2) and March 2003 (Unit 1).

Technology

Turbine steam path technology has seen substantial advances over the last 10 years. Designs that began with just improved sealing technologies have now progressed to three dimensional, computer developed surfaces, reducing both wear and steam path efficiency losses. The new HP section design incorporates latest technology sealing systems, blading designs and also includes at least one additional turbine stage within the HP section.

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These modifications have been completed at several dozen utilities world-wide and approximately 15 US utilities. Having had discussions with all 15 of these utilities we understand the concerns that have arisen and have set plans in place to avoid these concerns. Without exception, all 15 utilities consider their HP retrofit projects to be a considerable financial success.

Bid guarantees for both performance and HP section wheel power will be verified in section testing in accordance with established ASME PTC-6 standards. In addition to bid evaluation credits offered for high guaranteed performance and output, the specifications identify substantial penalties incurred by the supplier for each increment of guaranteed efficiency or output that the supplier fails to achieve within post-installation testing.

Summary

The high pressure retrofits on Units 1 and 2 provide the opportunity, with modifications in supporting systems, of a station (2 unit) output increase of up to 150 Megawatts. Forty (40) of these Megawatts being generated with no increase in fuel consumption.

HP TURBINE RETROFIT

Penalties and Incentives

The recommended penalties and incentives within the proposed HP turbine retrofit contract are based on concerns that have arisen in discussion with other utilities regarding delivery, extended installation schedules, performance and subsequent unit output. In every case penalties or incentives involve the exchange of dollars, this is based on actual expected costs or revenues to IPSC. Where possible, incentives or penalties have been developed without exchange of money. The penalties and incentives are associated with four specific areas of the retrofit:

1- Schedule Guarantees
- Partial outage extension avoidance incentive (non-cash)
- Penalty for late delivery
- Penalty for late installation

3- Performance Guarantees:
- Bid evaluation credit incentive (non-cash)
- Incentive for exceeding guarantee at performance test
- Penalty for achieving less than guarantee at performance test

4- Output Guarantees:
- Bid evaluation credit incentive (non-cash)
- Incentive for exceeding guarantee at performance test
- Penalty for achieving less than guarantee at performance test

Schedule Guarantees

Schedule guarantees are directed at two primary milestones.

(1) Prompt delivery
(2) Prompt Installation:

Delivery

For delivery two weeks prior to the scheduled outage start date, we are offering that the contractor would be allowed to avoid the first day of outage extension penalty ($100,000) should the installation run longer than their bid detailed schedule specifies, due to the contractors actions or designs. This incentive provides a significant motivation to the contractor for early delivery while providing greater insurance to IPSC that the outage preparations will be more thoroughly staged and detailed and therefore less likely to incur outage extensions.

The penalty imposed for late delivery will be assessed at the start of the outage, where plans must be altered significantly to enter the HP turbine and perform a complete restorative overhaul. The cost of the complete overhaul that would other wise be avoided is estimated at approximately $200,000. This amount has been assessed to the contractor on the first day of the outage, within the currently recommended version of the bid package.

Installation
The final penalty on schedule occurs where, due to the fault of the contractor, the outage must be extended. This extension of outage time brings a penalty to the contractor of $100,000 per day. Far short of the over $1,000,000 per day of average replacement energy cost, but in a range that will provide the necessary focus without scaring the bidders away.

Performance Guarantees

The intent of the specification is to encourage the bidders to keep their bid guarantees high as well as encourage them to exceed their guarantees where possible. The respective incentives and penalties are based on actual value to IPSC:

A bid evaluation credit (not payable dollars) is offered to encourage the bidder to maximize their performance guarantee in the bid package. The credit is based on the average performance (91%) achieved at other utilities based on a general phone survey of existing installations of both potential bidders. This credit, $10,000 per 0.1% in HP section efficiency bid in excess of 91%, is approximately half of the annual savings realized for 0.1% improvement in HP section efficiency. This credit will be substracted from the total bid amount for each respective bidder for evaluation purposes only.

The incentive for exceeding guaranteed performance is set such that no incentive is awarded for the first 1% above 91% performance but above 92%, the contractor receives $10,000 for each 0.1% above 92%, up to a maximum performance incentive of $100,000. This incentive is directed primarily to encourage careful quality assurance during manufacturing and installation to maximize section efficiency.

The penalty for testing less than 91% is the same as the incentive, $10,000 per 0.1% in HP section efficiency, however, measurement uncertainty of 0.25% is allowed prior to assessing the penalty. A penalty maximum of $100,000 is recommended.

Output Guarantees

Output guarantees are intended to have the same effect as performance guarantees. Bid high and test even higher, where possible. Output incentives and penalties are based on actual value to IPSC:

A bid evaluation credit (not payable dollars) is offered to encourage the bidder to maximize their output guarantees in the bid package. The credit is based on the anticipated output identified by our experience based PEPSE model at guarantee flows. The credit, $50,000 per MW of output above the experience based PEPSE model is far below the annual cost of replacement power per MW of approximately $400,000 but significant enough to encourage maximization of flow within the design window.

The incentive for exceeding bid guaranteed output is $50,000 per MW. The penalty for achieving less than guaranteed output is the same $50,000 per MW.

HP TURBINE UPGRADE PROJECT

Outstanding Issues

As we prepare to take advantage of the increased efficiency and output afforded by the HP Turbine upgrade there are several systems that require evaluation and possible modification. The most significant items identified to-date that require detailed assessment and potential upgrade within the foreseeable future are shown below with a first approximation cost estimate:

Item	Estimate/Unit
• Cooling Tower Performance Upgrade	$4,000,000
• Main Steam Safety Valve Addition	$ 150,000
• Cold Reheat Safety Valve Addition	$ 150,000
• Generator Cooling Enhancement	$ 100,000
• Generator Isophase Cooling Enhancement	$ 50,000
• Large Motor Bus Loading Equalization	$ 150,000
• ID Fan Intake Duct Design	$ 100,000
• Boiler Feed Pump Performance Upgrade	$ 150,000
• Main Step-up Transformer - current estimate (OEM conceptual comments due 1/12/01)	$ 100,000

(Full load testing on PA and FD fans is recommended for establishing current baseline.)

As part of the HP turbine upgrade project, each of the items listed above will be analyzed in detail with specific regard to:

- Maximum Continuous Operating Capability
- Operating Efficiency
- Operating Redundancy
- Maintenance Impacts
- System and Unit Reliability
- Required Capital Improvements
- Economic Justification

These analyses have been underway since early December and will continue through mid 2001. Funds for these modifications have not yet been included in the upcoming 2001-02 budget.

In the event that staff chooses to minimize the required modifications, load and flow could be maintained at or near current levels through at least two conventional methods: increasing throttling losses or reducing throttle pressure. Turbine efficiency losses associated with increased throttling for the six (6) summer months of reduced load would be in the range of 1% of Turbine Heat Rate or approximately $410,000 annually. Throttle pressure reduction associated with a load reduction of 10 percent would be in the range of 0.75% of Turbine Heat Rate or approximately $310,000 annually. The largest economic penalty would come from potential lost revenue. Using present factors, one year of 10 MW additional output is worth approximately $4,170,000.

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Purpose of Materials, Supplies or Services:

Improved Performance HP Turbine Retrofit

Date:	
Req./PA No:	161977
P.O. No:	
Vendor:	
Terms:	
FOB:	
Ship Via:	
Conf. To:	

Suggested Vendor: Altsom Power Inc.
2800 Waterford Lake Dr.
Midlothian, VA 23112
Attn: Greg Ferrara

Account No. 1TGX-402
Work Order No. 01-19846
Project No.

Qty	Unit	Description Noun Adjective Catalog # Seller or Manufacturer	Unit Cost	Extension
2	ea	Turbine, High Pressure, High Performance, in	6000000	$ 12000000
		accordance with the attached specifications.		
		Attached specifications include Field Service		
		Engineering, Internal Alignment and Program Quality		
		Assurance provisions associated with design, manufac-		
		ture and installation of retrofit high pressure		
		turbine.		
		TOTAL ESTIMATED COST		$ 12000000

Remarks: Current outage schedule requires that package be distributed to bidders on or before December 11, 2000 and that award of contract be placed by January 9, 2001.

Delivery requested by [Date] 02/17/02 Originator James Nelson

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_034559

Part F - Detailed Specifications

Division F2 - Technical Requirements

1.0 General:

This specification provides the technical information required for providing both products and services associated with supply and replacement of the high pressure turbine sections, overhaul of the intermediate pressure turbine, internal alignment of these two sections and technical direction services for effectively completing all turbine work scheduled for both the March, 2003 Unit 1 Outage and the March, 2002 Unit 2 Outage at the Intermountain Generating Station (IGS).

2.0 Unit Description:

Intermountain Generating Station consists of 2 sister units operating S-2, triple tandem-compound, single reheat, 20- stage, impulse type turbines with a double-flow nozzle. The high pressure turbine is a partial arc design with 7 stages and one, 4^{th} stage extraction. The turbine is controlled via a Mark II series electrohydraulic system.

The turbines have been increased in nominal output rating from an original installation output of 840 MWg to a current rating of 875MWg.

3.0 IPSC Planned Turbine Scope of Work:

The planned scope of work for the turbine generator during the Unit 2 outage beginning March 2, 2002 is:

- Replacement of the HP turbine section
- Major inspection and overhaul of the Intermediate Pressure Turbine section
- Testing and possible disassembly of the generator for repair of stator winding leaks.
- Main stop, control, combined reheat and ventilator valves
- Overhaul of servos, switches and PMG at front standard

The planned scope of work for the turbine generator during the Unit 1 outage starting March 1, 2003 is:

- Replacement of the HP turbine section
- Major inspection and overhaul of the Intermediate Pressure Turbine section
- Testing and possible disassembly of the generator for repair of stator winding leaks.
- Main stop, control, combined reheat and ventilator valves

- Overhaul of servos, switches and PMG at front standard

The above scopes of work are to be provided for each of two units at the Intermountain Generating Station during their respective outages. Bidders are encouraged to respond to the above specified outage start dates if possible. If adherence to the above dates places significant risk in either quality or delivery of the HP turbine section, the bidder may propose an alternate schedule for outage start date. Proposals with modified outage start dates more than 1 month later than those specified above, will likely be untenable.

4.0 Scope of Supply:

The scope of this specification includes the following:

1. Design, manufacture, shop testing and delivery of a new, high efficiency HP turbine section.
2. Field engineering services for on-site direction during installation of the new HP turbine section, overhaul of the IP section, overhaul of control, stop and combined reheat valves, overhaul of front standard servos and instrumentation and testing and operation of the completed turbine as listed in Section 6.0.
3. Field direction of electrohydraulic control system modifications for optimized valve operation including parts as required.
4. Internal alignment services for both the HP and the IP turbines.

5.0 Design Conditions & Criteria

The justification for this project rests on both performance and output. Therefore, all reasonable effort shall be made to identify and incorporate the most current and proven performance related technologies.

IPSC understands that by design, the new, high efficiency HP turbine sections are unable to provide both partial arc and full arc operational modes. Accordingly, IPSC chooses to specify a full arc operational design to take advantage of upper end operating efficiencies.

As a part of the modification to exclusive, full-arc control, the supplier shall provide required hardware and technical support for modifying existing valve operation. The supplier shall ensure that valve control, unit stability and generation flexibility are not restricted, encumbered or complicated beyond current capabilities.

The HP section shall be designed for the following throttle conditions and flow passing capability at valves wide open:

- 2400 psi
- 1000 F
- ????????? lbs/hr

The supplier shall be solely responsible for ensuring that all piping penetrations, instrument taps/wells, interfacing keys and supports, journals, couplings, snout sections, seals, etc. are of proper location and dimension.

Maximum allowable vibration in any plane in the fully assembled and operating turbine is 2 mils p/p, overall reading.

The HP turbine sections provided for installation on Unit 1 and Unit 2 shall be operationally interchangeable in every regard.

6.0 Field Service Engineering

Field Service Engineers shall arrive on-site no later than two days prior to the respective outage scheduled start dates. Field Service Engineers shall be available in accordance with the planned outage shift schedule, from two days prior to the outage scheduled start date, until released by IPSC following successful startup and operation of the turbine.

At least two qualified Field Service Engineers shall be provided, one for the day shift and one for the night shift. The engineers shall perform the following functions:

-Technical direction to IPSC for disassembly, cleaning, inspection, repair, part replacement, reassembly, rotor alignment, balancing, etc. of the steam turbine-generator.

-Assist IPSC with overhaul planning, schedule preparation and schedule updating.

-Prepare, and submit to IPSC, a technical report which details the inspections, repairs, and future recommendations related to the work done on the turbine-generator.

The Field Service Engineers shall have had formal training for field engineering on large, impulse design, steam turbine-generators. The Field Service Engineers shall have at least 10 years of field engineering experience in installation, repair and operation of these type machines.

7.0 Internal Alignment Services

The supplier shall provide labor, supervision, expertise, tools and equipment for full internal alignment of the HP and IP sections of the turbine. Where laser alignment technology is employed the supplier shall test all equipment at his shop prior to mobilizing to the site to prevent downtime due to faulty equipment.

The supplier shall provide adequate numbers of trained personnel in order to judiciously pursue completion of the internal alignment without interruption, during the scheduled alignment window.

Alignment personnel must be able to effectively coordinate all alignment information with the Field Service Engineers at the site, regardless of corporate affiliation. Personnel conducting turbine internal alignment work shall be trained and qualified in the procedures used and in operation of the equipment required for the work. The personnel shall have performed the same work on at least ten previous occasions, and at least five of those on large, impulse design steam turbines.

8.0 IPSC Provided Facilities

IPSC shall provide a single desk in an enclosed office trailer on the turbine deck for the field engineers to use. The trailer will also be occupied by IPSC personnel.

IPSC shall provide a single telephone line in the office trailer for use by the Field Service Engineers.

IPSC shall provide access to a fax and copy machine for use by the Field Service Engineers.

9.0 Reference Drawings

-Original acceptance heat balance (Figure 1)
-Current heat balance (Figure 2)

10.0 Operating Experience

Intermountain Generating Station has operated for the past 5-6 years with net capacity and availability factors in excess of 90%. Net output in excess of 95%.

Weekly valve and yearly tightness and overspeed testing has been successfully completed since original installation.

Turbine startups have been relatively smooth on both units. Only rarely is a balance shot required during startup.

On-line vibration is rarely above 3 mils p/p on any bearing. With continuous vibration archiving and trending capability, actions levels are based both on rates of change and on absolute vibration levels.

A load profile (Figure 3), typical of recent years is enclosed for your information.

11.0 Maintenance History and Provisions

The Intermountain turbines were overhauled completely by the OEM, on one occasion approximately 2 years after commercial operation. Since that time all maintenance on the turbines has been performed by IPSC personnel under the direction of a Field Service Engineer.

Turbine oil is monitored by on-site, predictive maintenance personnel who are fully trained in ferrographic, particulate and inductively coupling plasma analysis. The turbine oil was recently replaced on both units as the oil additive packages were showing signs of degradation affecting the oil/moisture separation properties. However, moisture has remained continually within allowable limits.
IPSC is aware of no dimensions affecting the installation of a new HP that have been modified since installation. The only significant modifications to the turbine since startup are follows:

- Hydraulic Coupling Bolts, (Ovako, Inc.)
- Retractable Packing, (Turbocare, Inc.)

The IPSC turbine bay crane is rated at 95 tons.

12.0 Manufacturing Schedule

Within six weeks of award, the supplier shall submit a detailed schedule showing all facets of completion of the HP turbine section and associated components. The schedule shall include:

- Order placement for material stock for each major component
- Expected delivery to manufacturing facilities of stock for each major component.
- Start of material acceptance testing for each major component
- Start of manufacture of each major component
- Start of shop testing for each major component
- Start of component sub-assembly, (i.e. rotor assembly, diaphragm assembly, etc.)
- Start of sub-assembly testing, (i.e. rotor testing, diaphragm NDE and final dimensions)
- Start of assembly (alignment, etc.)
- Final assembly dimensional verification

Updated manufacturing progress reports shall be prepared and submitted to IPSC on a monthly basis up to the date of final inspection and shipment. In addition to updated manufacturing and testing schedules, the supplier shall provide notification of testing identified by IGS as 'witnessed tests' in Section 17.0, 'Quality Assurance', at three separate intervals prior to the day of the test in order to allow for IGS travel arrangements:

- 30 days prior to the test
- 14 days prior to the test
- 7 days prior to the test

The supplier shall provide construction drawings for approval by IPSC prior to start of fabrication. Required approval date shall be clearly identified at the time of construction drawing submittal to IPSC. Approval of construction drawings shall not relieve the supplier of sole responsibility for proper design and manufacturing accuracy and quality,

13.0 Delivery Schedule and Incentives

The Unit 2 HP turbine section and associated components shall be delivered at the IGS facility no later than February 18, 2002.

The Unit 1 HP turbine section and associated components shall be delivered at the IGS facility no later than February 17, 2003.

For delivery of the HP section to the site two (2) weeks ahead of the outage start date the supplier will be allowed to avoid two days of penalty beyond his guaranteed installation schedule prior to any penalty being assessed. This means that with delivery two weeks ahead of the scheduled outage date, the maximum outage extension penalty will be reduced to $800,000 and will not begin accumulating until two days past the guaranteed installation schedule identified within the bid.

For delivery to the site after 12:00 midnight on the respective IGS delivery dates noted no early payment shall be made.

For delivery after March 1, 2002 for Unit 2 or after February 28, 2003 for Unit 1, a penalty of $200,000 will be assessed to the supplier to assist in paying for rebuild of the existing HP turbine section.

14.0 Installation Schedule and Incentives

IPSC is encouraging base and alternate bids that key on innovative methods for minimizing installation schedules while maintaining verifiable installation quality. The respective outages have a currently scheduled nominal length of 30 days. This 30 day schedule is defined as 'Breaker Open' to 'On-Line and Available for Full Load'.

All bidders shall prepare a 'guaranteed' installation schedule for the HP turbine replacement. The bid outage schedule for replacement of the HP turbine section shall provide detail from 'Breaker Open' to ' Turbine on Turning Gear'. The current maintenance schedule shows this as approximately 28 days.

The bid schedule shall include task level detail for removal of the existing HP section, field accommodation work within the existing HP shell and full installation of the new HP section including alignment. Major milestones shall include as a minimum:

- New HP components staged and ready for installation
- Turbine off gear and lube oil isolated
- Removal of HP outer shell
- Removal of HP rotor
- Removal of HP L/H casing
- Completion of L/H outer shell prep work and dimensional verification
- L/H casing installed
- Alignment complete
- Rotor installed
- U/H casing installed
- U/H outer shell installed
- HP installed and coupled

The current maintenance schedule is based upon a dedicated, HP turbine section crew consisting of 6 maintenance mechanics working 2 each 10 hour shifts per day, 6 days per week.

For each day that the outage length is extended due to the supplier's products or actions or the direct installation requirements of the new HP turbine section, the supplier shall be assessed a penalty of $100,000. The penalty maximum assessed for outage extension shall be 10 days or $1,000,000.

If the turbine section is delivered late and IPSC elects to proceed with installation of the new HP turbine, no outage extension penalty shall be assessed unless and until the suppliers bid installation schedule is exceeded due to the suppliers products, actions or direct installation requirements.

At least 90 days prior to the respective scheduled outages the supplier shall have a coordination meeting with IPSC Outage Management and prepare a complete installation information package based on the specific approach and schedule selected by IPSC. This final detailed schedule shall be provided to IPSC within 10 working days of the coordination meeting and shall provide completely detailed sequential instructions on installation and alignment of the HP section, including any modifications to existing HP section hardware, special tooling, equipment or services that may be required.

Both the outage schedule and duration are subject to change by IPSC. In the event of any IPSC initiated schedule change, IPSC will immediately notify the supplier and negotiate a mutually agreeable resolution.

The supplier shall identify within their prepared outage schedule, any interface concerns with the simultaneous overhaul on the IP turbine including bearing type/composition and positioning, coupling alignment, etc.

15.0 HP Section Performance Testing:

Initial performance testing shall occur as soon after the outage as reasonably possible. IPSC anticipates the ability to complete the initial performance testing within 1-2 weeks of startup. However, several factors could develop that could delay the test, these factors include an inability to achieve stable or acceptable turbine vibration limits, lack of permission from dispatch authority, unforseen load demands or problems with other plant equipment.

In addition to initial performance testing, IPSC will complete a confirmation test approximately 30 days following initial performance testing. Performance incentives/penalties shall be calculated and awarded based on the average of the initial performance test and the 30 day confirmation test.

The supplier is invited to be present during all testing. IPSC will apply best effort to confer with the supplier regarding all issues that may affect the evaluated performance of the turbine.

IPSC will prepare a specification and engage a qualified contractor for the performance tests. For general information the following criteria will form the basis of the performance testing:

1. The unit shall be operated at steady state, full load for approximately 1 hour prior to start of test.
2. Steady state shall be defined as fluctuations of not greater than:
    - 1.0% of absolute pressure readings
    - 5.0 degrees F, temperature readings
3. Test shall consist of a minimum 60 minute test, with readings taken a minimum of every 2 minutes.
4. Target testing criteria shall be throttle flow of ??????lbs/hr @ 2400 psi throttle and MWg output of ???????.

Testing tolerance for all forms and all sources of testing uncertainty shall be 0.25%. This is based on the following testing accuracies:

- 0.1%, throttle pressure
- 0.1 psi, HP exhaust

- 0.5 degrees F, all temperatures

All readings shall be taken at two parallel points allowing for direct indication of faulty equipment. Both elements shall be monitored and recorded during the equalization period and throughout the performance test for increased accuracy. All testing instrumentation shall be calibrated and traceable to NBS Standards. Instrumentation shall be calibrated both before and after testing is complete.

The cost of one initial performance test following the outage and one confirmation test approximately 30 days subsequent, will be borne by IPSC. All testing shall be considered valid and contractually binding if the HP section efficiency is tested to be no more than 2.0 percentage points below design efficiency.

If the measured section efficiency, during either the initial performance test or the 30 day confirmation test is more than 2.0 percentage points below design, an additional test shall be run and paid for by IPSC, as soon after the first test as operationally reasonable.

If the first test is within the 2.0 % window or if the second test is outside(below) the 2.0% window, the first test results shall be valid and contractually binding.

HP section efficiency shall be defined as measured across both the valves and the HP section; from throttle conditions to the HP section exhaust.

16.0 Performance Guarantees and Incentives:

****

TO PURCHASING: THIS COULD GO IN A COMMERCIAL SECTION

Bidders shall be awarded a bid evaluation credit (not payable dollars) of $10,000 for each 0.1% in HP section efficiency, above 91%, that is guaranteed in the respective bid.

Bidders shall be awarded an evaluation credit (not payable dollars) of $50,000 for each megawatt of generation capacity above ??????????? MW at VWO, 2400psi throttle, guaranteed in the bid.

****

Supplier shall be penalized ????????? if throttle flow at VWO, 2400psi exceeds 6,975,000 lbs/hr. This penalty covers near term reduced pressure operation and required system modifications.

The supplier shall be awarded a cash incentive of $10,000 for each 0.1% in performance that is confirmed by the performance test results above 92%, up to a maximum performance cash incentive of $100,000. No testing tolerance shall be applied above 92% prior to calculating the performance incentive.

The supplier shall be penalized $10,000 for each 0.1% below guaranteed HP section efficiency that is confirmed by the performance test results, up to a maximum penalty of 100,000. This penalty shall not take effect until after the 0.25% testing tolerance has been applied.

The supplier shall be awarded a cash incentive of $50,000 for each Megawatt of generation in excess of the bid guarantee that is proven during the initial and 30 day confirmation performance testing, up to a maximum of 5 Megawatts or $250,000.

The supplier shall be penalized $50,000 for each Megawatt of generation below the bid guarantee output that is confirmed during the initial and 30 day confirmation performance testing, up to a maximum penalty of $250,000.

17.0 Quality Assurance:

Vendor shall implement a quality assurance program addressing all phases of design, manufacture, installation and startup of the HP turbine section. The purpose of the HP section Q/A program is to assure that:

1. Design documents, drawings, specifications, quality assurance procedures, inspections procedures and purchase documents are maintained current, accurate and under control.

2. The purchased materials, equipment and services conform to the requirements of these documents.

3. Receipt inspections, in-process inspections, examination and testing are complete and appropriate.

4. Subcontracted work is adequately inspected and monitored.

5. Special processes such as welding, heat treating, hot forming and NDE are of adequate quality

6. Welders and NDE personnel are adequately qualified.

7. Nonconforming equipment and materials is properly documented, controlled and dispositioned.

IGS shall have full access, at all times, to the quality assurance procedures, instructions and nonconforming reports applicable to the equipment and materials furnished under this contract.

The quality assurance manual shall include the manufacturing locations of each major component, all tests to be performed on each component and assembly and shall list the individuals with respective phone numbers that will be in charge of quality verification at each site.

The supplier shall, as a minimum, provide for the following levels of documentation, review and acceptance of quality assurance procedures and reporting on all major components including the following:

1. Rotor
2. Buckets
3. Diaphragms
4. Inner Casing
5. Inner Casing Bolts
6. 1st Stage Nozzle

(Test Definitions Note:
Witness: The test may be attended by an IPSC representative
Review: IPSC shall review the test results prior to start of mfg.
Copy: IPSC shall receive signed copy of the test results within 1 week.)

	Witness	Review	Copy
Chemical/Mechanical Properties			1,2,3,4,5,6
Mill Certifications			1,2,3,4,5,6
Heat Stability Testing			1
Non-destructive Testing (Incl. welds and castings)		1,2,3,4,5,6	
Dimensional Checks	1,2,3,4,5,6		
Balance/Overspeed Testing		1	
Final Shipping Inspection	1,2,3,4,5,6		

Additional examination or testing may be required by IPSC of any welds, castings or forgings with indications exceeding code allowables or those having been or requiring repair.

Where designs incorporate sectionalized rotors, the root welds shall be examined using MT methods. Final passes shall also examined using MT and shall examined using UT from three angles of maximum reasonable variation.

18.0 Bid Submittals:

In addition to any other requirements of these specifications, the supplier shall provide the following information with the bid submittals:

1. A list of all components provided, with mfg. part numbers and including component life expectancy.
2. Balance criteria to be imposed by supplier .
3. Estimated Shipping Weight and Installation Weight of assembled HP
4. Detailed explanation of methods and equipment to be used in performing turbine internal alignment.
5. List of any additional items which the contractor will need IPSC to provide, other than those listed in Section 8.0.
6. Resume and experience list for each field service engineer, technician, or other personnel to be involved in the IGS based portions of the work.
7. Detailed plan for any on-site inspection work that must occur in advance of the installation, including the upcoming Unit 1 outage beginning March 5, 2001.
8. A best approximation schedule for completing the following major milestones: (to be shown in multiples of 10 hour shifts using up to 6 trained turbine mechanics)

-Old casing out
-New casing on final shims
-Rotor Aligned in bearings
-HP reassembled

9. A list of any special tools required for installation or maintenance of the new HP section. Including balance weight placement or casing guide pins.
10. A list of recommended spare parts associated with the HP section. The list shall include estimated life of each component and location/quantity of any supplier warehoused stock of each item.
11. Applicable section of each code and/or standard used in development and design of the HP turbine section including:
    ASTM - Materials Standards
    ASME - Performance and Construction Standards
    AISI - Material Standards
    ISO - Balance Standards (or applicable international standard)

19.0 Contract Document Submittals:

During the course of fabrication of the HP section, the supplier shall expeditiously submit the following information in accordance with the monthly updated, manufacturing schedules and reports outlined in Section 12.0:

1. Construction/fabrication approval drawings
2. A revised thermal kit based on the throttle conditions
3. Ongoing Q/A reports as specified in Section 17.0
4. Mill Certificates
5. Manufacturing progress reports
6. Rotor Balance Report including static unbalance at critical speeds and rated speed
7. Rotor Runout Report
8. Calculated Rotor Torsional Characteristics
9. Assembly and Interface Dwgs
10. Component and assembly rigging plan including accurate weight of each lift.
11. Piping connection and instrumentation port location drawings
12. Within 30 days after award the contractor shall submit a schedule of submittals including all drawings, by title and their estimated submittal and approval return dates.
13. Itemized list of each component type showing individual design weight.

20.0 Existing HP Section Availability

The existing, Unit 1, HP turbine at IGS is currently scheduled to be available for inspection, measurement and condition assessment during the upcoming outage currently scheduled to begin March 5, 2001. The following items are scheduled to be completed at that time:

1. The upper half HP section outer shell will be removed.
2. The 4th stage extraction line will be severed and drifted to allow access from the outside.

If the bidder desires to take advantage of this inspection opportunity, the bidder shall prepare and provide a detailed inspection plan along with the bid submittals as outlined in Section 18. The plan shall include the significant, foreseeable economic or schedule impacts that may occur as the result of the information to be gathered during the outage.

The successful bidder shall have up to four (4) days of access for inspection of the HP turbine on Unit 1. **The HP turbine inner casing will not be open.**

21.0 Shipping

All components and assemblies shall be packaged, coated, supported and secured to prevent corrosion, damage or deformation during shipping. Any damage sustained prior to delivery at the IGS facility shall be judiciously corrected by and to the account of the supplier.

Bearing journals areas shall be securely covered and protected by treated cotton cloth or acceptable equal to prevent inadvertent contact or corrosive elements.

22.0 Maintenance Manuals

The supplier shall provide 10 sets of maintenance manuals at time of delivery, including the following information:

- Detailed overhaul recommendations
- General Arrangement Dwgs.
- Rotor Clearance Drawings
- Diaphragm Alignment Dwgs
- Longitudinal X-section Elevation
- Shaft Torque Characteristic Plot

23.0 Warranty

Due to IPSC outage schedules, the supplier's warranty must extend at least two years beyond installation in order to verify the cause of and correct any significant efficiency reductions. Due to operational priorities, access to turbine components for warranty adjustments shall be at the discretion of IPSC.

IPSC shall retain the right to operate the components and equipment provided under these specifications regardless of any outstanding warranty issues. The supplier shall be released from any additional claims for damage incurred as direct result of such continued operation. Warranty obligations for defects not attributable to such continued operation shall remain the responsibility of the supplier.

Supplier shall provide schedule identifying any maintenance procedures or testing/inspection required to maintain the bid warranty provisions.

Bid Totals

		Unit 1(2003)	Unit 2(2002)
1.Price for Fully Assembled HP Turbine Section			
2.Price for Aligned /Partially Dis-assembled Section			
3.Price for Freight	(Fully Assembled)		
	(Partially Assembled)		
4.Contract Cancellation Cost:	>16 mo. before ship		
	12-16 mo. before ship		
	10-12 mo. before ship		
	6-10 mo. before ship		
	< 6 mo. before ship		
5. Field Service Engineering (To include all labor, expertise, travel, expenses and services.)			
6. Field Service Engineering Rates for Unanticipated Work Hours:	Regular Hours		
	10-16 Hrs/day		
	Holidays		

Travel time	______	______
Expenses/day	______	______
7. Turbine Internal Alignment Services (To include all labor, travel, expertise, expenses, equipment and services.)	______	______
8. Guaranteed HP Section Efficiency (Measured across both valves and HP section.)	______	______
9. Guaranteed Gross Unit Output	______	______
10. Price for Optional Retractable Packing (Packing design must be approved by IPSC representative.)	______	______
11. Guaranteed Delivery Dates	______	______

COMMERCIAL NOTES TO PURCHASING:

The bidder shall a provide a required payment schedule,

All costs associated with any reverse engineering shall be included with the original bid.

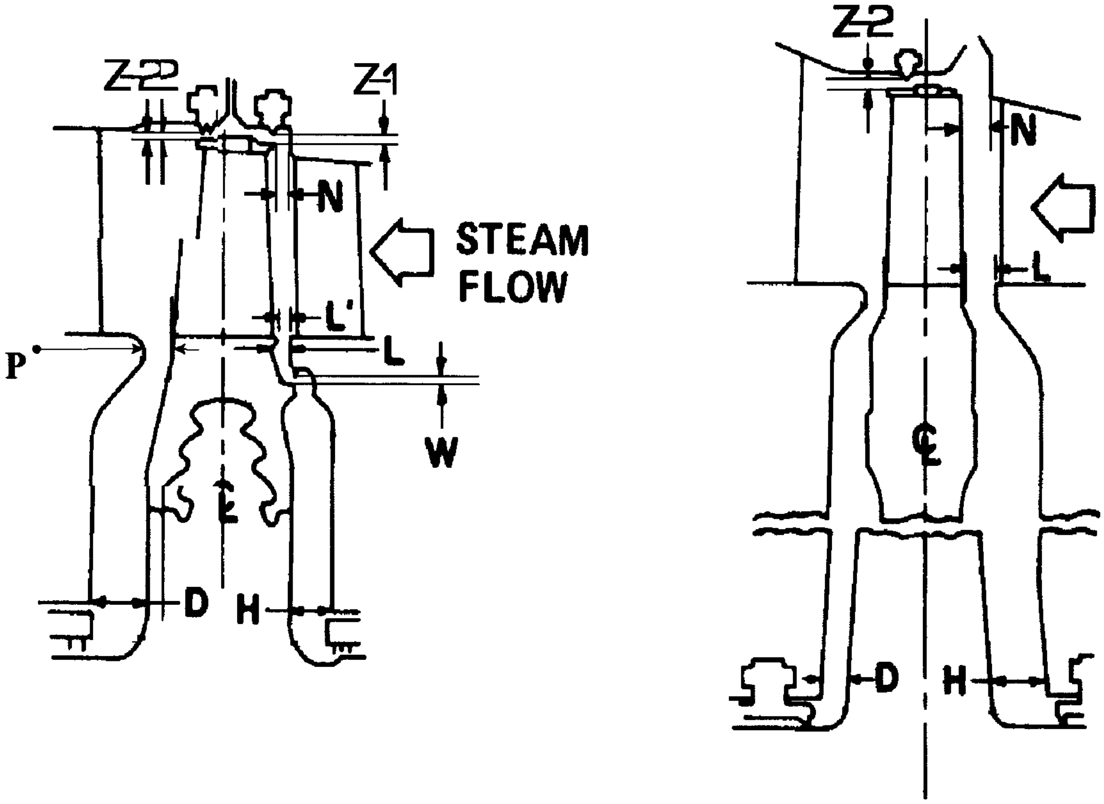

Figure 1: Steam Path Clearances

IP7_034574

HP WHEEL CLEARANCE DATA (OPENING)													
LO NO		WHEEL TO DIAPHRAGM AXIAL CLEARANCE								WHELL RADIAL CLEARANCE			
		D	P(E)	H	L	LL	LR	NL	NR	Z-1L	Z-1R	Z-2L	Z-2R
TE 8	A												
	E_{as}	0.689	0.500	0.343	N/A	0.268	0.268	0.224	0.224	0.031	0.031	0.031	0.031
	E_{ge}												
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	N/A	N/A	0.343	N/A	0.268	0.268	0.224	0.224	0.031	0.031	0.031	0.031
TE 7	A												
	E_{as}	0.547	0.496	0.343	N/A	0.268	0.268	0.224	0.224	0.030	0.030	0.030	0.030
	E_{ge}	1.260	0.695	0.534	0.390	0.250	0.250	0.222	0.222	NA	NA	0.050	0.050
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	-0.713	-0.199	-0.191	N/A	0.018	0.018	0.002	0.002	0.030	0.030	-0.020	-0.020
6	A												
	E_{as}	0.547	0.484	0.366	N/A	0.287	0.287	0.224	0.224	0.028	0.028	0.028	0.028
	E_{ge}	0.608	0.639	0.563	0.380	0.240	0.240	0.208	0.208	0.050	0.050	0.050	0.050
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	-0.061	-0.155	-0.197	N/A	0.047	0.047	0.016	0.016	-0.022	-0.022	-0.022	-0.022
5	A												
	E_{as}	0.524	0.472	0.378	N/A	0.299	0.299	0.224	0.224	0.028	0.028	0.028	0.028
	E_{ge}	0.679	0.650	0.711	0.370	0.230	0.230	0.199	0.199	0.050	0.050	0.050	0.050
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	-0.155	-0.178	-0.333	N/A	0.069	0.069	0.025	0.025	-0.022	-0.022	-0.022	-0.022
4	A												
	E_{as}	0.504	0.453	0.382	N/A	0.295	0.295	0.221	0.221	0.028	0.028	0.028	0.028
	E_{ge}	0.648	0.706	0.524	0.360	0.220	0.220	0.188	0.188	0.050	0.050	0.050	0.050
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	-0.144	-0.253	-0.142	N/A	0.075	0.075	0.033	0.033	-0.022	-0.022	-0.022	-0.022
3	A												
	E_{as}	0.480	0.429	0.374	N/A	0.287	0.287	0.213	0.213	0.028	0.028	0.028	0.028
	E_{ge}	0.710	0.650	0.555	0.350	0.210	0.210	0.179	0.179	0.050	0.050	0.050	0.050
	$D_{(A-ge)}$												
	$D_{(Eas - Ege)}$	-0.230	-0.221	-0.181	-0.350	0.077	0.077	0.034	0.034	-0.022	-0.022	-0.022	-0.022
2	A												

HP WHEEL CLEARANCE DATA (OPENING)

LO NO		WHEEL TO DIAPHRAGM AXIAL CLEARANCE								WHELL RADIAL CLEARANCE			
		D	P (E)	H	L	L'L	L'R	NL	NR	Z-1L	Z-1R	Z-2L	Z-2R
	E_{as}	0.457	0.406	0.374	N/A	0.283	0.283	0.197	0.197	0.043	0.043	0.043	0.043
	E_{ge}	0.679	0.720	0.726	0.340	0.200	0.200	0.166	0.166	0.050	0.050	NA	NA
	$D_{(A-ge)}$												
	$D_{(Ege-E as)}$	-0.222	-0.314	-0.352	N/A	0.083	0.083	0.031	0.031	-0.007	-0.007	0.043	0.043
	A												
1	E_{as}	0.457	0.406	0.276	N/A	0.213	0.213	0.185	0.185	0.028	0.028	0.028	0.028
	E_{ge}	1.470	0.729	NA	0.470	0.210	0.210	0.210	0.210	0.050	0.050	NA	NA
	$D_{(A-ge)}$												
	$D_{(Ege-E as)}$	-1.013	-0.323	0.276	N/A	0.003	0.003	-0.025	-0.025	-0.022	-0.022	0.028	0.028
GE	A												
1	E_{as}												
	E_{ge}	NA		NA	0.550	0.290	0.290	0.290	0.290	0.050	0.050	NA	NA
	$D_{(A-ge)}$												
	$D_{(Ege-E as)}$												

Completed By: Phong Do

Date: 2/14/02

HP DIAPHRAGM PACKING CLEARANCE AND WEAR MEASUREMENT (OPENING)															
Diaphragm				X	Y	Radial, A		Packing Ring Height (Ht)							
Sta	Rn	Fig				Left	Right	1	2	3	4	5	6	7	8
TE			A												
7		1	E_{as}	0.230	0.423	0.024	0.024								
			E_{ge}	0.340	0.500	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.110	-0.077	0.009	0.009								
			A												
6	R2	1	E_{as}	0.250	0.403	0.024	0.024								
			E_{ge}	0.340	0.500	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.090	-0.097	0.009	0.009								
			A												
6	R1	1	E_{as}	0.250	0.403	0.024	0.024								
			E_{ge}	0.340	0.500	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.090	-0.097	0.009	0.009								
			A												
5	R2	1	E_{as}	0.309	0.423	0.024	0.024								
			E_{ge}	0.345	0.505	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.036	-0.082	0.009	0.009								
			A												
5	R1	1	E_{as}	0.309	0.423	0.024	0.024								
			E_{ge}	0.345	0.505	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.036	-0.082	0.009	0.009								
			A												
4	R2	1	E_{as}	0.309	0.423	0.024	0.024								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.003	-0.011	0.009	0.009								

HP DIAPHRAGM PACKING CLEARANCE AND WEAR MEASUREMENT (OPENING)

Diaphragm				X	Y	Radial, A		Packing Ring Height (Ht)							
4	R1	1	A												
			E_{as}	0.309	0.423	0.024	0.024								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.003	-0.011	0.009	0.009								
3	R2	1	A												
			E_{as}	0.289	0.364	0.024	0.024								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.023	-0.048	0.009	0.009								
3	R1	1	A												
			E_{as}	0.289	0.364	0.024	0.024								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.023	-0.048	0.009	0.009								
2	R2	1	A												
			E_{as}	0.290	0.365	0.033	0.033								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.022	-0.047	0.018	0.018								
2	R1	1	A												
			E_{as}	0.290	0.365	0.033	0.033								
			E_{ge}	0.312	0.412	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	-0.022	-0.047	0.018	0.018								
1	R1	1	A												
			E_{as}												
			E_{ge}												
			$D_{(A-ge)}$												
			$D_{(ge-as}$												

Completed By: Phong Do Date: 2/14/02

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HP "N1" PACKING CLEARANCE AND WEAR MEASUREMENTS (OPENING)															
Pkg Heads				X	Y	Radial		Packing Ring Height (Ht)							
Sta	Rng	Fig				Left	Right	1	2	3	4	5	6	7	8
N1	1	2	A												
			E_{as}	0.290	0.550	0.025	0.025								
			E_{ge}	0.290	0.550	0.025	0.025								
			$D_{(A-ge)}$			0.000									
			$D_{(ge-as}$	0.000	0.000	0.000	0.000								
N1	2	1	A												
			E_{as}	0.290	0.550	0.025	0.025								
			E_{ge}	0.290	0.550	0.025	0.025								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	0.000	0.000	0.000	0.000								
N1	3	1	A												
			E_{as}	0.290	0.550	0.020	0.025								
			E_{ge}	0.290	0.550	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	0.000	0.000	0.005	0.010								
N1	4	1	A												
			E_{as}	0.290	0.550	0.020	0.020								
			E_{ge}	0.290	0.550	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	0.000	0.000	0.005	0.005								
N1	5	1	A												
			E_{as}	0.290	0.550	0.020	0.020								
			E_{ge}	0.290	0.550	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	0.000	0.000	0.005	0.005								
N1	6	1	A												
			E_{as}	0.290	0.550	0.020	0.020								
			E_{ge}	0.290	0.550	0.015	0.015								
			$D_{(A-ge)}$												
			$D_{(ge-as}$	0.000	0.000	0.005	0.005								

HP "N1" PACKING CLEARANCE AND WEAR MEASUREMENTS (OPENING)																	
Pkg Heads						Radial		Packing Ring Height (Ht)									
N1	7	1	A	X	Y												
			E_{as}	0.290	0.550	0.020	0.020										
			E_{ge}	0.290	0.550	0.015	0.015										
			$D_{(A-ge)}$														
			$D_{(ge-as}$	0.000	0.000	0.005	0.005										

Completed By: Phong Do

Date: 2/14/02

TABLE 1 - INTERMOUNTAIN POWER GENERATION TURBINE RETROFIT MAJOR INTERFACE LIST

No	Description	Alstom	GE	Effect or Comments
1	Critical Speed, rpm • 1^{st} • 2^{nd}	 ~1750 ~4300	 ~1950 ~4550	 None None
	Control Valve Change to Full Arc	Full Arc	Partial or Full Arc	All four CVs open or close simultaneously. There will no longer be any choice between partial arc and full arc operation. ALSTOM is providing (through Novatech) new digital position boards for the HP control valves. Some minor wiring changes will also be required within the governor panel and full instructions for this work will be provided. Following fitting of the new boards, it will be necessary to stroke the valves to set up the full open and full closed positions.
	Startup	Adhere to GE's	GE	No change. All starts are to be performed in according to the existing GE instructions using HP Inlet inner surface temperature in place of 1^{st} stage inner surface temperature. However, the reduction of the radial spill strip and turbine end axial clearances require an absolute adherence to the GE procedures.
	Shutdown	Adhere to GE's	GE	All shutdowns are to be performed to the existing GE instructions.
	Normal Operation	Adhere to GE's	GE	Operation, rates of loading and unloading remain as per the existing GE instructions.

TABLE 1 - INTERMOUNTAIN POWER GENERATION TURBINE RETROFIT MAJOR INTERFACE LIST				
No	**Description**	**Alstom**	**GE**	**Effect or Comments**
	Radial Clearances • N2 Packing • N1 Packing • Diaphragm Packing • Spill Strip Packing	 20 mils 20 mils 24 mils 28 mils	 15 mils 15 mils 15 mils 50 mils	 33% greater than GE's 33% greater than GE's 60% greater than GE's 44% less than GE's. This is the most probable rubbing area.
	Axial Clearances • Turbine end, wheel base to diaph inner ring "D" and "P"	 Vary	 Vary	 10% to 60% less than GE's. The Alstom axial clearances D and P (wheel base to diaphragm inner ring, TE) are smaller than the GE's. The "P" clearance is the smallest and most probable rubbing clearance in axial direction, for a rotor long (rotor expands faster than shell or shell contracts faster than rotor) condition.
	• Bucket to partition, generator end, (L')	Vary	Vary	7% to 34% greater than GE's
	• Bucket shroud to diaph outer ring, generator end, (N)	Vary	Vary	1% to 17% greater than GE's
	High Pressure Heater Extraction Pressure @ VWO	1096 psia	1094 psia	The new pressure is close to the original value
	1^{st} Stage Inner Surface Temp	HP Inlet	1^{st} Stage Inner Shell	Reposition the HP inlet inner surface thermocouple to the steam inlet. The new thermocouples should provide similar outputs in terms of temperature and response. Descriptions in the GE instruction manual and TGSI will be changed to "HP Inlet Inner Surface Temperature" from "1^{st} Stage Shell Metal Temperature"

TABLE 1 - INTERMOUNTAIN POWER GENERATION TURBINE RETROFIT MAJOR INTERFACE LIST

No	Description	Alstom	GE	Effect or Comments
	1st Stage Pressure	HP Leads Upstream of Bowl	1st Stage Inner Shell	The 1st stage pressure is used by the boiler controls as a measure of steam flow. With full arc admission the HP inlet pipe pressure is proportional to steam flow, therefore it is normal practice to use inlet pipe pressure in place of 1st stage pressure as a measure of steam flow. Re-pipe the existing 1st stage pressure transmitter to the new HP loop pipe pressure tapping is required. The transmitter may require re-ranging to suit the higher pressure (IPSC) in accordance with ALSTOM flow/pressure curve TS 29367
	IP Rotor Cooling Steam	816F	829F	OK
	HP Differential Expansion Alarms (DX1): • Rotor Long Alarm Hi-Hi • Rotor Long Alarm • Cold Set (reference) • Rotor Short Alarm • Rotor short Alarm Hi-Hi	 +0.430" +0.400" 0.000" -0.150" -0.170"	 0.200" 0.230" 0.630" 0.780" 0.800"	The new HP turbine is consistent with the existing GE differential expansion alarm and limit values.
	Rotor Vibration Alarms	No Change	GE	High speed balance up to 4300 rpm indicated maximum peak to peak vibration of less than 0.75 mils.
	Bearing Temperature Alarms	No Change	GE	OK
	HP Water Detection, Tops and Bottoms	No Change	GE	OK

August 12, 2002 File: b2881

Mr. Eric J. Tharp
Operating Agent for the Intermountain Power Project
Los Angeles Department of Water and Power
PO Box 51111, Room 1263
Los Angeles, CA 90051-0100

Reference: High Pressure Turbine Retrofit Project

Dear Mr. Tharp:

Request for Information on Turbine Blade Stress at 950 MW

This letter is In response to a request from your office for information regarding turbine blade stresses at the target load of 950 MW. The final portion of this analysis was recently completed by Alstom Power, Inc. A copy of Alstoms recent analysis is attached for your review.

As noted in the DWP report 'Turbine/Generator Load and High-Pressure Heaters' dated October 24, 1990 (Project Modification 253) as well as all associated memos, the concern over turbine blade stress arises only when high pressure heater strings trip while the unit is in turbine-follow or manual modes. The units are essentially always operated in Megawatt Control where immediate valve response maintains unit load with negligible fluctuation.

The following supplemental information associated with blade stress analysis at the target design flow rate of 6.9MMlbs/hr is provided to ensure a comprehensive understanding of the attention given to this issue throughout the HP upgrade project.

Analysis of turbine blade, partition and diaphragm loading associated with the scheduled 950MW uprate began well before an HP turbine section upgrade contract was signed. This issue has been addressed in several phases:

- Initial evaluation request to GE
- Initial evaluation request to Alstom
- Test verification of turbine operational parameters
- Final Alstom recommendations regarding heater out-of-service runbacks

Initial Evaluation Request to GE

Discussions with both potential bidders regarding blade loading during feedwater heater trips began in early November of 2000. The first documented response from GE on this subject occurred at 1:00pm on Thursday. December 21, 2000. At that time, GE was responding to our request to analyze a worst case operating turbine blade stress scenario of a double, high pressure heater string trip with initial condition throttle flow at 6.9 MMlbs/hr. In that discussion, Mr. Joe Liesig, Mr. Larry French and Mr. Bill Kuehn confirmed that 6.9MMlbs/hr would not be a problem in the stated condition and that they were prepared to proceed with the bid process based on the 6.9MMlbs/hr design target.

A written statement confirming this conversation was requested from GE but was never received. GE, however, submitted a full bid to provide the HP section upgrade based on the 6.9MMlbs/hr. (A copy of the bid evaluation detailing key parameters of the GE bid is attached.)

Initial Evaluation Request to Alstom

Alstom was also requested to provide an analysis regarding blade loading and stress at the target flow in early November of 2000. Alstom identified three concerns associated with increased throttle flow/stage pressures:

- Stress corrosion cracking at blade roots
- Heater shell design pressure limitations
- L-0 blade root stress

With discussion on IGS historical water quality, turbine overhaul NDE data and review of heater shell design pressure, the first two concerns were shown to be very low priority. Outage visual and non-destructive testing has revealed no concerns at the blade roots or other locations susceptible to stress corrosion. Initial estimates for heater extraction pressures were well below heater shell design maximums.

Alstom stated that the weakest link in blade stresses occurred at the L-0 or last stage blading due primarily to changes in condenser pressure. Alstom presented the attached GE design document at that time covering LP exhaust flow limitations for a range of turbine sizes, including that at IGS. The attached email from Alstom dated November 10, 2000 shows the substantial margins remaining between operation and design on the L-0 blade root stresses at target conditions.

Test Verification of Turbine Operating Parameters

In a similar approach taken by DWP in the October 1990 report, Alstom based their recommendations for operational limits on the operational stage pressures recorded during valves-wide-open (VWO) operation. Accordingly, during the post-installation, performance testing actual flows and stage pressures associated with VWO and nominal full load target of 950MW were recorded and instituted as maximum allowable operating parameters in all modes of operation.

Throttle flows recorded at full load (950MW) were notably less than target due to higher than guarantee HP section efficiency. As a result, throttle flow at 950MW was approximately equal to the IGS historical design limit of 6.6MMlbs/hr and stage pressures were within 2 percent of those used as the design limit established by DWP within the above noted report on turbine blade stresses.

Final Alstom Recommendations Regarding Heater Out-of-Service Runbacks
Alstom has recently issued their final recommendations on runbacks associated specifically with heaters out-of-service at the test verified flows and pressures. A copy of this document is attached. Of the original concerns, stress corrosion cracking is still considered to be a low level concern and heater shell pressures were verified to be well within the design maximum (see sheet 3 of Alstom analysis.) Flow induced blade stress at full load will also be incrementally less than anticipated due to reduced throttle flow at nominal full load, associated with the higher than guarantee HP section efficiency.

The attached Alstom analysis provides recommended runbacks associated with the VWO stage pressures for various combinations of high pressure heaters out-of-service. These runbacks will be reflected in the IGS load guide sheet and submitted for your approval in the near future. You may contact James Nelson at (435) 864-6464 with questions regarding these analyses.

Sincerely,

George W. Cross
President and Chief Operations Officer

JHN:jmg
Attachments

High Pressure Turbine Retrofit Project

Introduction
A competitively bid contract was recently finalized for supply of hi-performance, high pressure turbine sections on Unit 1 and Unit 2. The specifications include guaranteed increases in both performance and output of approximately 8.0%. This equates to approximately 20 additional Megawatts of output with 0 increase in fuel consumption. Additionally, the HP sections will be designed to provide up to 55 MW per unit of additional output following specific modifications to several balance of plant systems. The new turbine sections are scheduled for installation in March 2002 (Unit 2) and March 2003 (Unit 1).

Modifications associated with the high pressure turbine upgrade include upgrades to the boiler internals, generator cooling, cooling tower structure and flow paths, main transformer and buswork, scrubber flow path, auxiliary power system, boiler safety valves, circulating water makeup capacity. With the scheduled completion of all associated projects in April of 2004, station generating capacity will be designed for an increase of up to 150 Megawatts. Forty (40) of these Megawatts being generated with no increase in fuel consumption.

Technology
Turbine steam path technology has seen substantial advances over the last 10 years. Designs that began with just improved sealing technologies have now progressed to three dimensional, computer developed surfaces, reducing both wear and steam path efficiency losses. The new HP section design incorporates latest technology sealing systems, blading designs and also includes at least one additional turbine stage within the HP section.

These modifications include the replacement of the inner high pressure casing, the high pressure section wheel or rotor including all rotating blading, all high pressure section diaphragms or stationary blading, new seals and new bolting. Computational flow dynamic (CFD) models are developed to ensure optimal stage pressure ratios and extraction flows as well as greater dimensional accuracy in the machining process.

The new section is designed with larger blading which increases steam path turning radii and reduces total blade end losses. The larger blading has proven to virtually eliminate solid particle erosion throughout the steam path. Avoiding an approximate $3million repair of the steam path erosion occurring on our existing HP section nozzle box is one of the justification factors for completing this HP section retrofit.

These modifications have been completed at several dozen utilities world-wide and approximately 15 US utilities. Having had discussions with all 15 of these utilities we understand the concerns that have arisen and have set plans in place to avoid these concerns. Without exception, all 15 utilities consider their HP retrofit projects to be a considerable financial success.

Bid guarantees for both performance and HP section wheel power will be verified by section testing in accordance with established ASME PTC-6 standards. The specifications identify substantial penalties incurred by the supplier for each increment of guaranteed efficiency or guaranteed output that the supplier fails to achieve within post-installation testing.